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þÿ B e s t p r a c t i c e s i n t h e N a v y s e programs : strategic communication factors operating in the tactical forces

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Best practices in the Navy's energy programs

Strategic communication factors operating in the tactical forces

Abstract

The Department of the Navy is the second largest consumer of petroleum within the Department of Defense and has been tasked by Navy leadership to reduce energy costs in the tactical forces. Energy conservation can be both a cost effective and relatively quick way to reduce energy. To better understand how the Navy can more effectively encourage energy conservation, this study reviewed existing literature for relevant management and communication theory and practices, identified and evaluated existing Navy energy conservation programs, and interviewed Navy tactical forces' personnel regarding their perspectives on the effectiveness of current programs and their motivations for conserving. Results from published literature indicate that key factors affecting energy conservation behaviors include attitudes, cognitive understanding, motivation, leadership, and effective strategic communication practices. Assessments of existing programs resulted in a focus on two successful initiatives: the i-ENCON program and the Shipboard Energy Management Program. The benefits and drawbacks of these programs are discussed. Finally, interview results suggest several factors that may enhance or impede energy conservation efforts in the Navy including level of awareness of the problem, importance of setting specific goals, the need for feedback on effective energy conservation behaviors, the impact of material and social benefits, the importance of the role of leadership, the challenges and opportunities provided by Navy culture, the potential impact of process and policy barriers, and the importance of communication and outreach. Recommendations include the need to improve upon and expand existing programs; to tailor communication themes, messages, and channels to key audiences; to develop a risk communication plan; to design a process for evaluating conservation capabilities; and to support an integrated strategic communication process.

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Summary of communication factors for energy conservation in the Navy's tactical forces

Task Force Energy (TFE), established to provide strategic guidance and investment strategies to guide and oversee energy strategy for the U.S. Navy, enlisted the Center for Defense Management Research (CDMR) in a study to examine energy conservation behaviors in the Navy's maritime and aviation forces. Our goals were to identify major energy conservation programs in the Navy's tactical forces, to research recommended practices in conservation behavior change, and to outline the strategic communication factors necessary for a successful energy conservation communication plan. To this end, we have reviewed past and current research, examined existing programs in energy conservation in the tactical forces, and interviewed key members of the maritime and aviation forces to better understand the communication issues involved in this change effort.

The Department of the Navy is the second largest consumer of petroleum within the Department of Defense, and Navy leadership has called for increased alternative energy and conservation efforts. These efforts are focused primarily on alternative energy and more efficient equipment. Research suggests that these types of technological advances can significantly reduce energy consumption; however, they typically result in a one-time shift in consumption at a significant cost. Behavioral changes, on the other hand, can be inexpensive and have a long term impact on energy use. Because behavioral changes are typically low cost and can be part of a larger transformation effort, we focused our current research on these key change factors.

While it is clear that behavioral approaches can have a significant impact on conservation, there is no single 'best fit' approach

What the research tells us

When it comes to inducing behavior change, three psychological and sociological issues come into play: existing attitudes, cognitive mechanisms, and material and social incentives. These three factors can help the Navy form a general approach to changing behaviors around energy use. Combined with the specific recommendations flowing from our interviews with stakeholders, these behavioral approaches can have a clear impact on conservation. Although there is no single, best-fit approach, the best method is to incorporate all three of these elements in a strategic communication plan. To support this effort, we recommend that TFE consider the following:

- Use psycho-social and operational factors as leading indicators for energy conservation
- Design an assessment tool to quantitatively measure conservation capacity

A person's attitudes play an important role in decision-making. These personal beliefs and feelings can be described in terms of social identity and norms, social comparisons, and normative goal frames. Social identity theory suggests that a core driver of action is a person's desire to maintain a positive self-image, and that this self-image is enhanced by inclusion in a group. Related to social identity theory is the concept of social comparisons, where comparing oneself to, or even competing with, others can increase a person's motivation to change. Finally, normative goal frame theory suggests that people move between multiple goals that are dependent on a variety of environmental stimuli. All three of these attitudinal factors impact the willingness of actors to engage in new behaviors such as conservation. To support attitudinal change, we recommend that TFE consider the following:

- Use conservation messages that create a positive self image

Summary

- Leverage the influence of social networks
- Address the variability of goals across stakeholders

Cognitive appeals, or information-focused communication, are important on-going communication tools. Information can be used to direct a person's attention, to energize people, to increase learning of desired behaviors, and to increase the persistence of behaviors. One way that this is accomplished is through the use of goal setting and feedback. Rather than just stating the need for conservation, communication efforts should include information that provides specific feedback on desired activities that impact the specific goals of stakeholders. For instance, conservation communications can engage stakeholders and establish expectations by showing how one ship got 2% closer to their 10% reduction goals by turning off lights in vacant areas and installing CFL's. To help establish a cognitive framework, we recommend that TFE do the following:

- Increase awareness of the need to conserve
- Set specific goals for conservation efforts
- Provide feedback on specific actions taken to reduce energy use

Motivation is an important mechanism in creating behavior change. Motivational mechanisms focus on those things that satisfy a person's needs. One helpful concept in understanding environmental motivations and incentives is the concept of goal frames. This theory tells us that people who operate on goals of satisfying personal needs (hedonic goal frame) and increasing one's resources (gain goal frame) often operate in a way that is in conflict with environmental concerns. However, those people who make decisions based on shared perceptions (normative goal frame) are more likely to engage in long term conservation behaviors. When looking at changing behavior, all three of these motivations come into play at different times and for different people. The challenge is to strengthen normative goals and make the personal needs frame more compatible with conservation activities. To help align your communication efforts with your stakeholder's goals, we recommend the following:

People who make decisions based on shared perceptions are more likely to conserve

- Address the variety of motivations operating in the Navy
- Demonstrate the personal, team, and group benefits of conservation
- Leverage social pressures to increase conservation behaviors

Incentives are the key operator in stimulating individuals to act. There are two types of incentives: material and social incentives. Material incentives—e.g., money and consumables—are directly related to the satisfaction of personal needs and in providing resource gains. Social incentives, on the other hand, are more internal and include needs such as social belonging and high self-esteem. People are motivated by a variety of incentives; however, material incentives tend to result in short-term behavior change, while social incentives are more likely to have a longer-term impact. Based on the research, we recommend that TFE include both material and social incentives:

- Provide material awards to motivate short term activities
- Design appropriate social rewards to stimulate long term behavior change

Stakeholder needs should drive the design of communication plans. Effective communication efforts tailor messages and channels to specific audience needs and behaviors. These stakeholder strategies include creating common ground through consistent framing of messages, targeting messages and media to the appropriate audience, and aligning messages to accepted social norms or perceptions. Consequently, we recommend that TFE:

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- Identify preferred communication channels for the key change agents
- Frame messages in Navy preferred themes
- Target messages to specific audiences

Strategic communication should be formalized and adequately supported to be successful. Research is clear on the need to empower teams, use an iterative process, and maintain on-going interaction with stakeholders. An empowered team is one that is aligned with the strategic objectives of the organization, has supportive management, and has a staff that is well informed and included in decision-making. For instance, strategic communication teams should have a seat at the executive steering committee table, have the resources to embed themselves within the organization, and be able to play a part in developing leadership communication. Another way to ensure effective strategic communication is to create an iterative process for evaluating success. The DoD specifically calls for an iterative strategic communication process of listening, monitoring, and adjusting of messages. This iterative approach provides a way to assess the effectiveness of communication activities and can be used as another feedback mechanism to incrementally build an understanding of key audiences. Finally, direct interactions with stakeholders improve the effectiveness of strategic communication efforts by generating greater personal ownership and engagement leading to more a more fully integrated change effort. We recommend that TFE consider strengthening their strategic communication efforts:

Direct interactions with stakeholders improves the effectiveness of strategic communication efforts

- Include strategic communication as a key partner in setting strategy
- Provide your strategic communication team with the resources and leadership to succeed
- Increase direct interactions with stakeholders
- Design and test your communication strategies

Existing programs

There are two major programs that impact energy conservation in the Navy's tactical forces: the i-ENCON program, and the Shipboard Energy Management and Cold Iron program.

The i-ENCON program is a NAVSEA program that aims to increase fuel efficiency of ships through information and incentive programs. The information component identifies operational behaviors that can reduce energy consumption. Operational elements include more efficient sailing, more efficient engine use, optimized navigation practices, improved maintenance, and daily living adjustments. i-ENCON also has a strong incentive program that provides material benefits to ships that reduce energy use. These incentives are usually distributed throughout the ship as discretionary funds. i-ENCON also emphasizes the role of leadership and encourages commanding officers, chief engineers, and propulsion assistants to participate. It utilizes face-to-face, print, and web communication channels for outreach. Although strong on operational factors, the i-ENCON program does not heavily address attitudinal change factors. i-ENCON is a strong program and we recommend that TFE do the following in relation to the i-ENCON program:

In fiscal year 2009, i-ENCON realized a record 1.36 million barrels of oil in fuel avoidance

- Increase Navy awareness of the program
- Expand the program to Aviation
- Continue the use of cash incentives
- Expand the use of social incentives (personal recognition, pride of service and team)
- Continue the emphasis on desired operational behaviors
- More fully develop leadership and team building behaviors

Summary

The Shipboard Energy Management and Cold Iron program (SEMPCI) was a pilot program at the Navy Region Southwest from 2007-2008. The program worked with ships at port (cold iron) to reduce their electrical load while at dock. Typical activities included turning off air conditioning, compressors, and redundant fire pumps while ships are in dock; installing efficient lighting; and reducing electrical load. The SEMCI program focuses primarily on providing awareness and feedback on electrical use. It utilizes experienced engineers as trusted agents for educational outreach to the ships. Additionally, it employs a computer control system (SCADA) to provide quantitative feedback on electrical use. The program leveraged the support of senior leadership (Commander of Naval Surface Force) to reach out to Commanding Officers and Chief Engineers. Key to its success is the emphasis on peer communication and specific feedback on operational behaviors that lead to a reduction in electrical use. However, the program does not explicitly employ attitudinal or motivational tactics and is currently under-financed. The SEMPCI program has proved itself effective in reducing energy use and we recommend that TFE consider improving the program through the following activities:

The Shipboard Energy Management Project, using smart metering, saved $4.3 million in one year.

- Expand the program to other ports
- Communicate the value of the program
- Expand the use of trusted agents to other programs
- Continue peer-to-peer educational outreach

Findings from the field

In addition to our review of relevant research on conservation communication, as well as our evaluation of existing energy programs, we conducted a series of interviews to uncover the specific psycho/social factors at play in the Navy's tactical forces. There were 18 participants, primarily from aviation and maritime forces. They were comprised of three Commanding Officers, four staff members, three program managers, and eight fleet operators. The factors uncovered in our interviews and discussed below can be used to create powerful messages that are tailored to the specific concerns of Navy personnel.

Participants varied in their perceptions of conservation and in the roles that they played in communicating the need for conservation. First, most participants recognized that much of their budget was related to fuel costs and that current and future reductions in budget would impact their fuel use. However, participants differed in how they perceived the importance of these shortages. Some expressed a general sense of environmental concern when asked about the need to conserve, but only a few related the high cost of fuel to our ability to defend ourselves. Second, maritime leadership, operational staff, and pilots all surfaced as important stakeholders in improving the Navy's conservation efforts. In the maritime forces in particular, there is a chain of influence that impacts energy conservation. First, senior leadership, through policy, sets fuel targets and the overall direction for conservation. Ship's captains are responsive to this direction. Captains are also largely autonomous when deciding the specifics of ship operations and are therefore key change agents in institutionalizing energy conservation. In addition they set the tone for other ship's members. In our research, the ship's operational staff was strongly impacted by the direction or limitations set by senior staff. In addition, operational staff also identified several areas where energy could be conserved.

Target key change agents and use personalized message themes

In aviation, the pilots appear to be a key change element because they also have a great deal of autonomy in their decision making around fuel use. As aircraft pilots, they are responsible for balancing the use of resources with perceived safety. For instance, safety concerns determined things like how much fuel they carry and how much they dump. Because there is so much variability and inter-dependency in stakeholder's

goals, we recommend using a broad based approach to behavior change that targets key change agents and uses a variety of personalized message themes and frames:

- Focus communication efforts on key audiences—e.g., ship's captains and pilots
- Have senior leadership set specific targets for fuel use
- Engage all levels of ship personnel in conservation efforts and incentives
- Incentivize energy conservation innovations
- Increase awareness of the relationship between conservation and national security
- Emphasize the impact on the marine environment and naval families

Information about conservation is not filtering down to the tactical forces. For those already interested in "green" activities, the only channels of communication that were mentioned were *Current Magazine* and information provided by the i-ENCON program. The only other source of information or motivation was through recent orders mandating a 10% reduction in maritime fuel use. However, in a discussion of other successful change efforts, participants indicated that face-to-face interactions were preferred over other media channels, and that these personal contacts were most effective when they included all levels of the command. In addition, participants confirmed what research suggests: that targeted appeals are a powerful way to personalize benefits and translate conservation effects into savings that are important to the stakeholders themselves. Participants felt that when these targeted appeals are combined with specific feedback on the results of actions taken, they would be more likely to conserve. Based on our findings, we recommend that TFE strategic communication do the following:

Face-to-face interactions are preferred

- Map preferred delivery channels to specific key audiences
- Utilize personal forums (communities of practice, focus groups, and suggestion boxes)
- Design and test messages for clarity, vividness, saliency, and personal relevance
- Provide feedback on specific actions impacting fuel use (usage data, regular reporting, and competitive rankings)
- Include conservation practices in operational documents (maintenance and operations)
- Set attainable goals for conservation

Ingrained beliefs impact conservation behavior. These beliefs can either support or conflict with desired change efforts. Areas where the beliefs align with conservation should be leveraged to reinforce conservation messaging. For instance, in the Navy, competitive spirit, the idea of personal responsibility, and loyalty to country are all strong cultural norms. These norms should be used to frame conservation activities; for example, conservation can be framed as a "patriotic activity." However, there are also several attitudes that are in seeming contradiction to conservation. For our participants, mission goals and readiness often outweighed conservation goals. A common explanation that we encountered for not conserving was that it negatively impacted readiness. In addition, we saw examples where the warfighter culture encourages a more free-wheeling approach in which autonomy and speed are valued. We recommend that TFE frame all calls to action in terms of accepted beliefs:

"I think that we're coming from a culture of 'Damn the cost of fuel, full speed ahead"

- Stress the relationship between logistical efficiencies and warfighting improvements
- Align messages with the goals of mission accomplishment
- Frame messages to align with value frames (defense capability, battle space efficiency, force multiplier, pride of service, competitive challenge, family values, and personal responsibility)

Risk assessments drive the decision to conserve. Both maritime and aviation personnel primarily based their decisions on whether or not to conserve energy on the perceived amount of risk that was involved. Perceived risks included impacts to readiness, the ship, and sailor safety. For instance, the decision of ship

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captains to run on fewer engines or at a slower speed was based on their perceived risk of floundering. Likewise, reducing lighting on the ship while at port was seen by some COs (but not others) as a potential safety risk. For Pilots, risks to readiness, the safety of planes, and the danger of damaging arresting gears were all cited as potential risks. Even though we uncovered risk as a key factor affecting decision-making, we still do not know the extent to which these assessments of risk are accurate, nor do we know which of them have the greatest impact on behavior. We do know that personal assessments of risk are known to be subject to inaccuracies (such as previous experience applied inappropriately) and individual characteristics (such as the need for control and the familiarity with the task). We therefore recommend that TFE conduct a more comprehensive study of risk and risk perceptions that includes:

"Energy conservation makes sense, but we have to be really careful in terms of what risk we assume"

- a complete list of the potential risks and risk probabilities
- determining which risk factors have the greatest impact
- determining which biases are most prominent
- developing messages that address risk perceptions and elicit the desired behavior
- testing, revising, and evaluating messages for effectiveness

Material and social incentives are an important tool in increasing energy conservation. First of all, one of the key current incentives for both COs and Ensigns was the mandated reduction in energy use. For aviators, anything that helped them improve readiness was seen as an incentive. In contrast, for both maritime and aviation, efficiency improvements had a mixed impact as an incentive. Efficiency alone was not seen as an effective motivation; however, when efficiency is used to refocus resources on the mission—i.e., a material incentive—then efficiency could be a motivator. Participants also noted that they would be motivated to conserve if the consequent savings could be redirected to other areas, particularly in light of the current budget reductions in maintenance and training. Participants were also motivated to conserve when they received personal benefits such as increased comfort, less work, or other personal perks. Material incentives are not the only motivator, however. Our participants identified two important social incentives—peer approval and recognition—that impacted their self-image and increased the likelihood that they would conserve energy. During our interviews, examples from other change initiatives highlighted the importance of these social incentives. To provide a well-rounded approach to changing behavior, we recommend the following:

"If you save money on your fuel cost... could you turn around and use that money for tools or flight gear or new computers?"

- Make incentives concrete and attainable
- Provide material incentives that increase training and exercise time
- Provide material incentives that impact daily living conditions
- Provide social incentives that impact social standing

Existing processes, technologies, and policies impact the Navy's ability to conserve energy. Our interviews with maritime and aviation forces revealed several technical solutions that are or can be used to reduce energy use. These solutions include the use of simulators, auxiliary propulsion units, controllable pitch propellers, solar power, and new ship and hull designs. Of particular note is the strong resistance that we saw to the use of simulators. While simulators are recognized as a valuable training tool, there is significant resistance to their use. This resistance stemmed from a combination of scheduling challenges and the fact that the simulator programs were often not up-to-date with current planes' capabilities. These factors, in addition to a general reluctance to give up hands-on flying time, increased the resistance of aviators to the use of simulators.

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We also uncovered several process enablers and barriers. Conservation enablers for aviation included more efficient use of runways, improved air traffic control systems, increased landing weight allowances, better route planning, and delayed light burning. For maritime, enablers included better tanker configurations, closer tracking of fuel use, and the inclusion of a 10% buffer on technical requirements; all these procedural improvements were identified as potentially leading to more energy conservation. Our participants also noted a number of policy barriers. Some of the areas where conservation is negatively impacted by policy include fuel certification procedures, end of year budgeting processes, tank cleaning procedures, and strict training requirements. In addition, organizational barriers such as conflicting priorities and poor communication between working groups were all noted as limiting the impact of conservation efforts. To further explore issues of potential policy barriers, we recommend that TFE:

"Is there a spot in a FITREP for the fact that you conserve fuel?"

- Improve access to simulators
- Ensure that simulator functionality is up-to-date
- Conduct an in-depth review of policies impacting energy use
- Utilize operational staff to identify potential process and technology improvement

Introduction and background

Task Force Energy, the Department of the Navy's lead organization for reducing energy usage in the Navy, is undergoing a comprehensive strategic communication effort to positively influence the Navy's energy conservation efforts. In support of this effort, our research sets out to understand how specific communication factors come into play when considering the U.S. Navy's efforts to reduce energy use in the tactical forces. To this end, we have reviewed past and current research on implementing environmental behavior change, examined existing programs in energy conservation in the tactical forces, and interviewed key members of the maritime and aviation forces to better understand the communication issues involved in this change effort. Specifically, we examined the attitudes, cognitive perceptions, incentives and leadership factors involved in conserving energy in the U.S. Navy's maritime and aviation forces. These factors can be used to design a strategic communication plan that leverages viewpoints of those who support energy conservation, addresses key points of resistance, and involves stakeholders in ongoing energy conservation improvements.

Why Energy Now?

Not since the oil crises of the 1970s have we seen such interest in energy policies. The current volatility of oil prices, the Navy's increasing usage of petroleum, recent budgetary pressures, increased political pressures to reduce carbon emissions, and our nations' reliance on foreign sources of oil have all lead to a renewed focus on reducing the Department of Defense's (DoD) energy usage.[1] The Department of Defense is the nation's single largest consumer of energy and relies heavily on petroleum-based fuel for sustaining its forces and weapons platforms for military operations.[2] U.S. military forces require vast quantities of fuel to operate combat and support vehicles, generate power at forward-deployed locations, and move troops, equipment, and supplies. Moreover, high fuel requirements on the battlefield can place a significant logistics burden on military forces, limit the range and pace of operations, and add to mission risks, including exposing convoys to attack.[3]

The Department of the Navy, as the second largest consumer of petroleum within the DoD, has long been concerned with improving energy efficiency and has made significant advances in on-shore energy conservation.[4] For example, energy-efficient construction has been used to construct Building 850 on Naval Base Ventura County.[5] In addition, several new technologies on ships, such as stern flaps and the new bulbous bow design, are helping to improve the efficiency of our maritime forces. While these are positive actions, the Secretary of the Navy, The Honorable Ray Mabus, is calling for an increase in both the use of alternative energy and in energy conservation:

[1] Defense Science Board. Report to the Secretary of Defense, Office of Under Secretary of Defense, for Acquisition, Technology, and Logistics. Report of the Defense Science Board Task Force on DoD Energy Strategy: More Fight—Less Fuel. Washington, DC: Defense Science Board. March 2008.
[2] Government Accountability Office. Report to the Subcommittee on Readiness, Committee on Armed Services, House of Representatives. Overarching Organizational Framework Needed to Guide and Oversee Energy Reduction Efforts for Military Operations. Washington, DC: United States Government Printing Office, GAO-08-426. March 13, 2008.
[3] Ibid.
[4] Andrews, Anthony. Congressional Research Service. Report to Members and Committees of Congress. Department of Defense Facilities Energy Conservation Policies and Spending. Washington, DC: Congressional Research Service. February 19, 2009.
[5] Long, Bryan. 2006. The Energy Policy Act of 2005 & Its Effect on the Navy. Currents, no.1544-6603: 46-51.

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> *"Energy costs siphon resources away from vital areas. The potential for disruption and the possible vulnerability of energy supplies could threaten our ability to perform on the battlefield…Navy and Marine Corps can, and should, do more. As we continue to increase conservation and develop alternative energy options, the Department of the Navy can mitigate the impact of energy volatility, use energy as a strategic resource for operational advantage, and become a leader in environmental stewardship."*[6]

We also see a renewed focus on energy conservation efforts in the commercial sector. The maritime industry is a good example. The world has about 50,000 merchant ships that carry 90% of traded goods and emit five percent of the world's total carbon dioxide each year. These merchant ships, prompted by mounting pressure, volunteered to reduce their speed, which had a potential reduction in fuel use of 25%.[7]The commercial aviation community has also taken steps to reduce the consumption of fuel. For example, airlines are cutting weight and overhauling operations to conserve fuel and save money[8]; Boeing has installed winglets on their aircraft for improvement in fuel consumption[9]; airline companies have stopped flying the older gas-guzzlers and are buying new, more fuel-efficient aircraft; and some airlines are switching from using regional jets to large turboprops for shorter air routes.[10]

Given rising costs, decreased availability, and environmental concerns regarding energy usage, the Navy is committed to addressing energy issues now more than ever.

Why conservation?

The Navy and industry take a multi-level approach to reducing energy use. In addition to technological innovations and the use of alternative fuels, conservation is an important part of this multi-level approach. Behavioral changes in energy conservation can have a considerable impact. The majority of the research in energy conservation has been done on households and organizations, both military and nonmilitary. These studies show that behavioral interventions can reduce energy consumption in households by up to 30%.[11] Additionally, in organizations, there are several case studies of how behavioral interventions can impact energy use. For example,

- Natural gas use in offices has been reduced by 6% through two simple behavioral changes—uncovering radiator grates and standardizing settings[12]
- CO2 emissions were reduced by 350 metric tons a year on a college campus at a savings of $130,000[13]
- Strategic communication efforts at two military bases reduced base-wide consumption by 10%, resulting in $50-$150,000 in savings.[14]

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[6] Mabus, The Honorable Ray. Secretary of the Navy. United States Congress. Statement before the House Committee on Appropriations Subcommittee on Defense on FY10 Department of Navy Posture June 3, 2009.
[7] 2008. Ships Slow Down to Save Fuel. Civil Engineering (08857024) 78, no. 3, (March): 36-36.
[8] Chandler, Jerome Greer. 2007. A Gallon Here, A Gallon There…. *Air Transport World* 44, no. 2, (February): 35-37.
[9] 2008. Winglets Become Increasingly Viewed As Standard For Values. *Aircraft Value News* 17, no. 12, (June 9): 1-2.
[10] Bachman, Justin. 2008. Airlines Give Propellers Another Spin. *BusinessWeek Online* (April 30): 5-5.
[11] Gardner, G., and P. Stern. 2008. The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change. Environment 50, no. 5, (September 1): 12-24.
[12] Staats, Henk, Esther van Leeuwen, and Arjaan Wit. 2000. A Longitudinal Study of Informational Interventions to Save Energy in an Office Building. Journal of Applied Behavior Analysis 33, no. 1, (April 1): 101-104.
[13] McMakin, Andrea H., Elizabeth L. Malone, and Regina E. Lundgren. 2002. Motivating Residents to Conserve Energy Without Financial Incentives. Environment and Behavior 34, no. 6, (November 1): 848-863.
[14] Ibid.

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In addition to research and case studies, there is useful information to be gained from formal energy conservation programs. For example, in the Navy tactical forces specifically, there are two existing programs that show promise for energy conservation. The first, the Incentivized Energy Conservation Program (i-ENCON), is an incentive program that is focused on the maritime environment. I-ENCON has demonstrated significant fuel savings of up to $48 million in fuel cost avoidance in the first quarter of fiscal year 2009.[15] The second program, the Shipboard Energy Management Program (SEMCI) is focused on reducing energy use while ships are at dock, and they have seen energy reduction savings in the range of $4.3 million.[16]

Energy conservation primarily deals with consumption, and there are two ways to affect consumption levels: technological advances or behavioral modification.[17] Although technological advances—which either increase efficiencies or provide alternative energy sources—can reduce energy consumption, they typically promote only a one-time shift in consumption at a significant cost.[18] Behavioral changes, on the other hand, can be inexpensive and have an ongoing and longer term impact on energy reductions over time.[19] Our study focuses primarily on behavioral solutions because those solutions are relatively low in cost and can be implemented immediately.

The role of attitudes, cognition, and incentives

Energy costs, along with the reliance on foreign sources to provide the energy needs of our nation, have increased the interest in energy conservation. While it is clear that behavioral approaches can have a significant impact on conservation, there is no single, best-fit approach to induce energy conservation behaviors given the large variety of contexts. For example, such mitigating factors as climate conditions,[20] home features and appliances, and income[21] all affect levels of energy conservation. Nonetheless, even with these factors accounted for, Sonderegger noted that an estimated 70% of variation in household energy consumption was based on household behaviors rather than household structures or technological modifications.[22] Similarly, energy consumption can vary greatly within the United States Navy tactical forces based on a number of factors including maintenance requirements, mission requirements, training requirements, and operation tempo. Because the conditions vary so greatly, it is important to focus on psychosocial factors—that is, attending to what motivates people to change rather than specific energy-saving changes per se. This focus on psychosocial factors can lead to interventions that are appropriate to the situation and can lead to longer-term energy conservation behaviors.[23]

The psychosocial model used throughout behavioral modification research applies a tailored approach to behavioral intervention based on the specific targeted group for inducing energy conservation behaviors. This model is derived from research that integrates societal, group and individual-level processes that directly contribute to changing behavior.[24] The extensive literature on motivation theory provides a number

[15] United States Navy. "i-ENCON Program Realizes Record $48M Fuel Savings." Navy.mil. February 20, 2009.
[16] Duke, Jon. Navy Region Southwest. "Shipboard Energy Management Pilot Project." NRSW E-Notes, No. 132. January 30, 2008.
[17] White, Lawrence T., Barbara A. Curbow, Mark A. Costanzo, and Thomas F. Pettigrew. 1983. Social Psychological Approaches to Promoting Lifestyle and Device-Oriented Conservation Behaviors. Advances in Consumer Research 10, no. 1: 636-640.
[18] Ibid.
[19] Schultz, Wesley P. 1998. Changing Behavior with Normative Feedback Interventions: A Field Experiment on Curbside Recycling. Basic and Applied Social Psychology 21, no. 1: 25-36.
[20] Fritzsche, D. J. 1981. An Analysis of Energy Consumption Patterns by Stage of Family Life Cycle. Journal of Marketing Research 18, (May): 227-232.
[21] Newman, D. K., and D. Day. 1975. The American Energy Consumer. Cambridge: Ballinger Publishing Company.
[22] Sonderegger, R. C. 1977. Movers and Stayers: The Residents Contribution to Variations Across Houses in Energy Consumption for Space Heating. Energy and Buildings 1: 313-324.
[23] Schultz, 1998.
[24] McMakin, Malone, and Lundgren, 2002.

of ways to explain why people are motivated to change their behaviors. For this research, we draw primarily from Social Identity Theory, Social Comparison Theory, Goal-setting Theory, Goal Frame Theory, and Incentives research. In the following sections, we briefly outline these theories as they relate to our three primary areas of focus: attitudinal mechanisms, cognitive mechanisms, and motivational/incentive mechanisms for behavior change. These areas were derived from early research and evolved from the assumptions that:(1) People would conserve energy if they had more positive attitudes towards the change (attitudinal), (2) People would conserve energy if they had more information about energy consumption and conservation (cognitive) and (3) People would conserve energy if they were motivated to do so (motivation).[25] These three behavioral factors call for specific types of interventions and should prove to be a useful structure for understanding energy conservation within the Navy's tactical forces.

Attitudes impact decision-making

Attitudinal mechanisms are personal beliefs or feelings that come into play when making decisions. In our research with the tactical forces, these attitudes range from the individuals beliefs about the need to reduce energy consumption to beliefs about the Navy itself. Published research identifies several theories pertinent to pro-conservation attitude change: social identity theory, social comparison theory and normative goal frame theory.

Social identity theory

Social identity theory proposes that people strive for a positive self image and that part of their identity is based on their membership in a group.[26] This desire for a positive self image can be used to strengthen or improve the quality of an individual's pro conservation attitudes by leveraging the influences of existing associations.[27] To be successful, actions designed to leverage social identity theory need to take into account mitigating factors such as the strength of the link between existing attitudes and desired behavior norms and the perceived convenience of the appropriate pro-conservation behavior.[28] Social identity theory can be used to guide strategic communication efforts targeted at peer-to-peer interactions.

Social comparison theory

Social comparison theory presents the notion that comparison, and even competition, with others impacts behavior change. First, comparisons with others can increase one's motivation to change when the other's action is seen as positive. Second, comparisons to others can reduce uncertainty and help establish standards of personal behavior.[29] In the appropriate situations, comparison and competition can be used to help influence conservation behaviors.

Normative goal frame theory

Normative goal frame theory suggests that individuals have multiple goals present at any given time and are continually moving between these goals. Specific actions are taken depending on cues that one receives from the environment about the most appropriate course of action for a given situation.[30] This theory suggests that effective change efforts should align with a variety of stakeholder goals.

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[25] Berry, Sandra H., and John D. Winkler. The RAND Corporation. United States Department of Energy. Household Energy Conservation: Strategies for Behavioral Research. Santa Monica, CA: The RAND Publications Series, N-1909-DOE. October 1982.

[26] McMakin, Malone, and Lundgren, 2002.

[27] Cook, Stewart W., and Joy L. Berrenberg. 1981. Approaches to Encouraging Conservation Behavior: A Review and Conceptual Framework. *Journal of Social Issues* 37, no. 2, (November 2): 73-107.

[28] Ibid.

[29] McMakin, Malone, and Lundgren, 2002.

[30] Lindenberg, Siegwart, and Linda Steg. 2007. Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior. Journal of Social Issues 63, no. 1: 117-137.

Introduction

Information can change behavior

Cognitive mechanisms look at how information and data affect behavior. For the purposes of this study, we identify two cognitive factors as key: issue awareness and goal setting

Issue Awareness

First, any change efforts need to ensure that there is adequate information provided about the issue or the nature of the change. Cook and Berrenberg identify three cognitive factors that affect conservation behaviors: (1) awareness of the resource shortage, (2) the perceived negative consequences of the shortage, and (3) the specificity and feasibility of recommended actions to prevent the negative consequences from coming to fruition.[31] These factors indicate that the first step in any conservation change effort should be to make sure that there is a sufficient awareness of the need for action and sufficient knowledge of the consequences of inaction.

Goal-setting

Another key factor in behavior change is the influence that goals have on focusing behavior and motivating personnel. Locke and Latham define a goal as, "the object or aim of an action, for example, to attain a specific standard of proficiency, usually within a specified time limit."[32] Goal-setting theory conveys the notion that setting goals has the ability to focus behavior and motivate personnel. Although goals differ for each individual, setting goals has the potential for increasing the persistence and intensity of a given behavior and assists employees in channeling their behaviors towards performance enhancement actions.[33] Locke and Latham found that "specific, difficult goals consistently led to higher performance than urging people to do their best."[34] They proposed four mechanisms that affect performance. (1) Goals provide direction; they direct an individual's attention and effort towards goal related activities and direct attention away from irrelevant or misguided actions. (2) Goals have an energizing effect; higher-level goals yield greater levels of effort than do lower-level goals. (3) Difficult goals increase an individual's persistence. (4) Goals have an indirect effect on an individual's arousal; that is, an individuals' behavior is influenced by task-relevant knowledge and learned strategies (improved cognition).[35] Goal setting theory emphasizes the importance of goals in getting ones' attention, energizing action, increasing persistence effort, and indirectly on learning.

Goal-setting theory also introduces the idea of feedback as a motivating force. Feedback provides information to employees about their progress towards their goals. Feedback on one's progress towards a goal is a key determinant of successful behavior change. Van Houwelingen and Van Raaij (1989), for instance, found that daily feedback towards a 10 percent conservation goal resulted in exceeding the conservation goal by 2.3 percent when compared to a control group.[36] In addition, multiple feedback studies showed that participants receiving indirect feedback conserved up to 10 percent more than the control group, and direct feedback (metering or continuous monitoring) resulted in an increased energy conservation of up to 15 percent when compared to the control group.[37]

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[31] Cook and Berrenberg, 1981.

[32] Locke, Edwin A., and Gary P. Latham. 2002. Building a Practically Useful Theory of Goal Setting and Task Motivation: A 35-Year Odyssey. The American Psychologist 57, no. 9, (September 1): 705-717, p. 705.

[33] McShane, Steven L., and Mary Ann Von Glinow. 2007. Organizational Behavior: Essentials. New York: McGraw-Hill/Irwin.

[34] Locke and Latham, 2002, p. 706.

[35] Ibid.

[36] Van Houwelingen, Jeannet H., and W. Fred Van Raaij. 1989. The Effect of Goal-Setting and Daily Electronic Feedback on In-Home Energy Use. *Journal of Consumer Research* 16, no. 1: 98-105.

[37] Darby, Sarah. Energy feedback in buildings: improving the infrastructure for demand reduction. *Building Research & Information* 36, no. 5 (September 2008): 499-508.

By ensuring that sailors are aware of the need to conserve, know the consequences of inaction, are given specific goals, and provided with feedback on the impact of their actions, the Navy can help improve the effectiveness of their conservation efforts.

Motivations energize behavior

Motivational mechanisms focus on those things that satisfy a person's needs, either material or social. In discussing motivation, it is necessary to understand that which energizes human behavior.[38] Two factors are key in energizing behavior change: the pursuit of personal gain and the use of incentives.

Personal Gain

Related to goal setting theory, Lindenberg and Steg, present the concept of goal frames.[39] Goal frame theory focuses on the processes and attitudes that influence goals. Those processes and attitudes are the primary determinant of the way in which an individual interprets a situation, understands the information, and takes action.[40] There are three primary goal frames: hedonic, gain, and normative goal frames. Hedonic and gain goal frames, unlike normative goal frames, are more directly related to personal gain. Hedonic goal frames imply that individuals are motivated by needs satisfaction or intrinsic motivations. Gain goal frames imply individuals are motivated by what is best for them, primarily in the sense of resource availability or the potential to increase one's resources, namely money.

Motivating employees by addressing their core needs and their perceptions of what is perceived as beneficial can be an effective method for inducing energy conservation behaviors.

Incentives

Another way to induce energy conservation behaviors is through the use of incentives. There are two distinct categories of incentives: material and social incentives. Material incentives are primarily extrinsic rewards that stimulate gain goal frames and result in temporary behavioral changes. Social incentives on the other hand, provide intrinsic motivation and play into and individuals' pursuit of their ego needs.[41] Although both types of incentives provide opportunities to induce energy conservation behaviors, it is necessary to analyze each target group and modify the incentive program to adequately motivate the targeted population. Incentives can also produce unintended consequences. Ill structured reward systems bring about unintended behaviors and consequences and should be avoided.[42]

The use of appropriate material and social incentives can improve the likelihood and persistence of conservation behaviors in the Navy's tactical forces.

The role of strategic communication

A key factor in energy conservation is designing and executing strategic communication to support new behaviors. Strategic communication is defined as "the purposeful use of communication by an organization to fulfill its mission."[43] To fulfill an energy conversation mission, it is critical to understand what motivates those who need to make necessary changes in energy usage. The better one understands one's audience and frames messages for common ground, the more effective one's strategic communication efforts will be in persuading

[38] Kerr, Steven. 1979. Organizational Behavior. Columbus: Grid Publishing, Inc.
[39] Lindenberg and Steg, 2007.
[40] Lindenberg and Steg, 2007.
[41] Kerr, 1979.
[42] Kerr, Steven. 1975. On the Folly of Rewarding A, While Hoping for B. Academy of Management Journal 18, no. 4: 769-783.
[43] Hallahan, Kirk, Derina Holtzhausen, Betteke van Ruler, Dejan Vercic, and Drishnamurthy Sriramesh. 2007. Defining Strategic Communication. International Journal of Strategic Communication 1, no. 1: 3-35.

others to adopt behavior that leads to a problem's shared solution.[44] In the context of energy conservation specifically, strategic communication can help to influence behavior change if applied appropriately and effectively. For example, communication interventions stressing the values of patriotism and environmentalism were found to be successful in reducing energy usage at two U.S. military installations. The values of patriotism and environmentalism were derived from pre-intervention consultations and interviews with key audiences.[45] In addition to understanding the audience, effective strategic communication draws on a variety of communication approaches. For instance, a combined focus on increasing awareness, providing feedback, and targeting appeals to specific audiences was found to positively influence energy conservation behavior, especially when combined with other measures such as material and personal incentives.[46]

There are many ways to examine strategic communication, but Barrett's Strategic Employee Communication Model (2002)[47] provides a useful framework. In her model, there are seven key components that need to be considered: (1) the organization's strategic objective, (2) supportive management, (3) targeted messages, (4) effective communication forms or media, (5) a well-positioned communication staff, (6) an ongoing assessment of the strategic communication effort, and (7) integrated processes that include communication in the organization's regular activities. An effective strategic communication program needs to integrate all these components across the enterprise.

Strategic alignment

The first component to a strong strategic communication plan is a clear understanding of the organization's overall strategic objectives. The strategic objectives of the organization are the highest-level, overarching goals that support the organization's vision. One effective way to communicate this vision when changes are occurring is by way of a "from/to" chart. This is a simple table that lists the organization's old vision and associated strategic objectives in contrast with the organization's new vision and associated strategic objectives. The strategic objectives can be broken down into their constituent parts so that it becomes clear to all those within the organization which changes will be necessary to support the new vision. Strategic communication must reinforce the organization's strategic objectives by disseminating them throughout all levels of the organization. However, this dissemination can be challenging in a military environment. Due to the intrinsically high turnover rates in military commands, residences, bases, etc., short-term energy conservation campaigns are unlikely to be successful in the long term. Therefore, it is important that energy conservation is clearly established as an organizational-wide fundamental value that is incorporated into the organization's policies, regulations, and decision-making at all levels.[48]

Supportive management

A second component of good strategic communication is the necessity for supportive management. For our purposes, we define both leaders and managers as those who have the ability to influence those below them in the organizational hierarchy. It is well known from the organizational change literature that leadership and management play a critical role in implementing organizational and individual behavior change. For strategic communication efforts to be effective, it is important that leaders/managers play an active role in vertical and horizontal communication; without such credible and widespread communication, leaders are

[44] Conger, Jay A. "The Necessary Art of Persuasion." In *Communication for Managers*, compiled by Cindy King, Jim Suchan and Christine Grosse, 175-186. University Readers, Inc, 2009.
[45] McMakin, Malone, and Lundgren, 2002.
[46] Berry and Winkler, 1982.
[47] Barrett, Deborah J. 2002. Change Communication: Using Strategic Employee Communication to Facilitate Major Change. Corporate Communications: An International Journal 7, no. 4: 219-231.
[48] McMakin, Malone, and Lundgren, 2002.

unlikely to motivate and sustain long term change.[49] This view is clearly supported by the Department of Defense. For example, the DoD specifically includes leadership as the first of nine proposed principles in its definition of strategic communication.[50] Because of their high organizational positions, leaders act as authority promoters who have the power and resources necessary to gain compliance from those who might otherwise be unwilling or lack motivation to participate in an organizational change effort.[51] However, forced compliance is not sufficient. For leadership to be effective, leaders need to demonstrate commitment through action and communication. Employee commitment is generated when subordinates observe that a leader is passionate and truly believes in what they are advocating.[52] A leader's actions must also model the behavior desired from their employees in order to generate individual and corporate buy-in. Therefore, in order for energy conservation efforts to be effective within the Navy's tactical forces, leadership must demonstrate it as a priority in the chain of command from the Chief of Naval Operations (CNO) to the Commanding Officer (CO) of each ship, squadron and base. For example, during the Navy Acquisition Reform (AR) efforts of 1994, a one-day stand-down was organized during which the entire acquisition workforce focused on improving operations by reducing costs. Top-level commitment was demonstrated when senior leaders personally participated in the stand-down by discussing the importance of AR and presenting awards.[53]

Targeted messages

A third component of strategic communication efforts is targeted appeals. Targeted appeals are defined as simple, very specific communication messages aimed at particular audiences.[54] Targeted appeals tend to be more effective than general persuasive appeals in attempts to influence an individual's attitude about conserving energy.[55] Tailoring messages to a specific intended recipient helps translate the higher-level organizational message into actionable messages that are understandable by specific individuals or groups.[56] This concept is related to the concept of "framing," the process whereby one finds common ground to appeal to those whom they are attempting to influence or persuade by addressing their preoccupations.[57] Targeted appeals that are framed to align with audiences' existing attitudes can be powerful tools in a behavior change program.[58]

Messages should also target social norms, or perceptions of what is commonly done in a given situation[59]By communicating that others are engaging in energy conservation behaviors, organizations can increase the chances that those within the organization follow suit. Utilizing social norms as targeted messages is effective for two reasons: (1) such communication raises general awareness of energy conservation behavior, and (2) it leverages an individual's tendency to look to others for evidence of how to act under conditions of uncertainty/organizational change. For example, this strategy for message design was supported in a research study in which hotel guests were given several appeals to conserve water by reusing their towels.

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[49] Barrett, 2002.
[50] United States Department of Defense. Principles of Strategic Communications. August 2008.
[51] Zerfass, Ansger, and Simone Huck. 2007. Innovation, Communication, and Leadership: New Developments in Strategic Communication. International Journal of Strategic Communication 1, no. 2 (May 2007): 107-122.
[52] King, Cynthia, L., Douglas Brook, and Timothy D. Hartge. Center for Defense Management Research. Report to U.S. Navy Sea Enterprise. Effective Communication Practices During Organizational Transformation: A Benchmarking Study of the U.S. Auto Industry and U.S. Naval Aviation Enterprise. Monterey, CA: Naval Postgraduate School, NPS-CDMR-GM-07-001. July 2007.
[53] Bennett, Alex. "A Systems View of Communicating Change." In *Making It Happen: Stories from Inside the New Workplace*, compiled from *The Systems Thinker* Newsletter, 107-113. Pegasus Communications, Inc., 1999.
[54] Berry and Winkler, 1982.
[55] Lindenberg and Steg, 2007; Steg, 2008; Berry and Winkler, 1982.
[56] Barrett, 2002.
[57] Conger, 1991.
[58] McMakin, Malone, and Lundgren, 2002.
[59] Griskevicius, Vladas, Robert B. Cialdini, and Noah J. Goldstein. 2008. Social Norms: An Underestimated and Underemployed Lever for Managing Climate Change. International Journal of Sustainability Communication 3: 5-13.

The most effective appeal in increasing towel reuse was the one that stated that the majority of hotel guests reused their towels. That appeal generated even higher pro-conservation behavior when it stated that guests in that specific room had reused their towels. The research found that the effects were due to "the impact of similar others"; that is, the tendency for people to put more trust in those with whom they share similar characteristics or circumstances. Leadership can also utilize this persuasive approach, but they must be wary of communicating the wrong social norms. A negative reaction can occur when one focuses on undesirable behaviors in targeted messages because this may indicate that such behavior is the norm, and is therefore acceptable.[60] Instead, messages should target desirable behaviors.

Finally, targeted messages should also be consistent across domains. Strategic communication occurs in four separate but interconnected domains: (1) the physical domain—where action takes place, (2) the information domain—where information is created, manipulated and shared, (3) the social domain—where cultural, political, social and historical experiences serve to interpret information, and (4) the cognitive domain—where understanding is created in actors' minds.[61] First, it is important that the actions in the physical domain are consistent with messages to ensure that credibility is not undermined by the "say-do gap," which occurs when actions contradict words. Second, it is important to create messages that are consistent across the information and social domains. Organizations can build trust by creating information that is consistent with and builds on an audience's experience (personal, social, historical, cultural). Finally, in the cognitive domain, good strategic communication can utilize effective framing to help audiences identify with change messages in a way that is consistent with their own frame of reference.[62] By remaining consistent across the four domains, organizations can deliver a coherent message that aligns with stakeholder perceptions.

Effective communication media

The fourth component of Barrett's framework is the need for effective communication media. Communication media refer to the communication vehicles or channels used to reach audiences. Within the information domain these media include print, radio, television, the Internet, video, phone, word of mouth and rumors, among others. In the physical domain, the media consist of person-to-person visits and interactions, such as conferences, workshops, education and networking.[63] The most effective communication medium is direct, face-to-face communication.[64] However, a variety of other communication forms have been shown to be successful as well. Mass communication techniques such as newsletters and videos can provide helpful information to employees.[65] Regardless of medium, messages that convey information in a vivid, salient, and personal format, as well as include visual modeling of specific actions to be taken, can be expected to generate energy-efficient behaviors. Simple, easily-understood examples, visual figures, pictures, and graphs can aid employees in understanding what is asked of them.[66]For example, an energy-conservation campaign at a military installation included videos of residents modeling desired energy conservation behavior, energy conservation cartoons, electronic reader boards, and display booths at on-post fairs, as well as children's games and activities.[67] Effective forums such as ad hoc task groups, surveys and other suggestion processes

[60] Griskevicius, Cialdini, and Goldstein, 2008.
[61] United States Department of Defense. Office of Support to Public Diplomacy. Strategic Communication: Theory and Framework. October 2007.
[62] US DoD, 2007.
[63] US DoD, 2007.
[64] Barrett, 2002; King, Brook, and Hartge, 2007.
[65] Proctor, Tony and Ioanna Doukakis. 2003. Change Management: The Role of Internal Communication and Employee Development. *Corporate Communications: An International Journal* 8, no.4, (2003): 268-277.
[66] Zerfass and Huck, 2007.
[67] McMakin, Malone and Lundgren, 2002.

can also be effective in communicating how employee input is being used to generate personal ownership of the change process.[68]

Well-positioned communication staff

The fifth important component in Barrett's framework is the need to have well-positioned communication staff. In order for strategic communication to be effective throughout the organization, organizations must establish a communication staff that includes people who are intimately familiar with and intricately involved in the organization's most important issues and strategic business planning processes. The senior member of this communication staff must have a "seat at the table" in order to understand the organization's strategy and be involved in the decision-making process.[69] A 1997 study determined that 93% of top communication officials met with the CEO to discuss strategy either directly or indirectly through a vice president. This allowed these communication officials to have a say in both the formulation and the implementation of the organization's strategy. In particular, it helped them to address critical questions such as whether or not key constituencies would be receptive to senior leadership's proposals, what the best approaches were for persuading these constituencies, when the organization knew when it had been successful in persuading these constituencies and what constituted measurable results.[70] Additionally, in order to establish individual and corporate buy-in, it is critical that the communication staff be personally involved in the change efforts so that they can be seen as actual change agents and not just disseminators of information. [71],[72],[73] One way to ensure a well-positioned communication staff is through a Strategic Communication Team (SCT). An SCT consists of a multi-level, cross-functional group of communications staff members, as well as selected workers and managers from the organization at large. The SCT has 4 objectives: (1) assess current organizational communication practices, (2) address potential communication gaps, (3) design and implement the change communication program, and (4) act as change advocates. The SCT is of central importance to the strategic communication program in that it provides information to and from the organization and brings credibility to the change effort. In fact, the mere presence of such a team indicates to most within the organization that change is taking place.[74]

Ongoing assessments

Another key component in Barrett's framework is ongoing assessment. Ongoing assessments refer to formal and frequent organization-wide measurements of strategic communication efforts against clearly defined goals.[75] In other words, ongoing assessments are a feedback mechanism to assess strategic communication's effectiveness toward achieving the organization's strategic objectives. Research has consistently demonstrated the critical importance of feedback, both in energy conservation and organizational change efforts in general.[76] Another key ingredient in strategic communication is the use of an iterative methodology. The DoD recommends a method of listening, monitoring, and adjusting efforts as changes occur. This methodology consists of nine steps that form spiral approach to designing strategic communication programs: (1) define policy goals, (2) identify audiences, (3) conduct an audience analysis of current perceptions and identify the desired effects communications should achieve on those perceptions, (4) identify themes, (5) frame goals and tailor messages, actions and metrics for audiences, (6) harmonize words,

[68] Spencer, Robert. 2000. Managing Change. Electric Perspectives 25, no. 1, (January/February): 12-23.
[69] Barrett, 2002, p. 222.
[70] Forman, Janis, and Paul A. Argenti. 2005. How Corporate Communication Influences Strategy Implementation, Reputation and the Corporate Brand: An Exploratory Qualitative Study. *Corporate Reputation Review* 8, no.3, (October 1): 245-264.
[71] Spencer, 2000.
[72] Barrett, 2002.
[73] Zerfass and Huck, 2007.
[74] Barrett, 2002.
[75] Barrett, 2002.
[76] Berry and Winkler, 1982; Spencer, 2000; McMakin, Malone, and, Lundgren, 2002; Barrett, 2002; Lindenberg and Steg, 2007.

actions and policies, (7) synchronize across mediums and time frames, (8) anticipate, preempt and counter adversary response, and (9) assess, update audience analysis, and recalibrate.[77] This type of iterative approach helps ensure that organizations can respond to changing conditions and build effective communication strategies.

Integrated processes

The last component of Barrett's model is integrated processes. Communication must be fully integrated into all aspects of the organization's processes to achieve optimal effectiveness. Thus, it must be built into the agenda of meetings and discussions of strategic objectives and planning. Furthermore, this communication process must be reciprocal in nature; that is, strategic communication should strive to include lower-level employees in strategic decisions. By doing so, leaders can generate greater personal ownership by causing employees to become more excited in their work and feel more connected to the organization's vision, making them better able to further the goals of the organization. Starbucks' "Open Forum" program provides an example of an effective integrated two-way communication process, in which employees are encouraged to e-mail ideas to their managers. Then, each quarter, face-to-face meetings occur at various venues throughout the nation during which employees interact with senior management and hear first-hand about company strategy and goals. Microsoft also communicates frequently with its employees via its weekly newspaper Microsoft News which is delivered nationwide to every employee's desk. Content of the paper evolves based on feedback from readers, demonstrating to employees that their ideas are highly valued.[78]

Strategic communication efforts are a key element in managing organizational change. Its role is to not only increase understanding, but also to help change the organization's beliefs and actions. As we've seen, when we look at changing beliefs and attitudes, we need to address the full range of communication factors that impact the change efforts. The following section takes a look at three existing programs within the Navy's tactical forces that attempt to address these factors.

[77] US DoD, 2007.

[78] Argenti, Paul A., and Janis Forman. 2004. The Employee Care Revolution. *Leader to Leader* 2004, no.33, (July 1): 45-52.

Existing programs

Review of existing programs

Our initial task was to identify any existing programs in the Navy's tactical forces. With assistance provided by Task Force Energy, we identified only two programs specifically targeted towards reducing energy use:

- The Incentivized Energy Conservation program (i-ENCON)
- The Shipboard Energy Management and Cold Iron program (SEMCI)

Based on our understanding of the critical issues involved in strategic communication efforts as discussed in Section 1, we reviewed the two existing conservation programs. In addition, because our interview participants identified the use of simulators as an energy reduction factor, we have included a brief discussion of the issues that surfaced in the use of simulators. The next section reviews the key social-cultural issues of each program that are relevant to energy behavior change.

i-ENCON program

Spearheaded by NAVSEA to reduce ships' energy consumption,[79] i-ENCON helps increase fuel efficiency in order to stretch the budgeted dollars as far as possible.[80] This program was implemented fleet wide in fiscal year 1999.[81] In October 2002, it won the Presidential Award for Leadership in Federal Energy Management – Outstanding Performance.[82] I-ENCON has continued to provide the U. S. Navy's fleets with new energy conserving technologies, conservation training, strategies, and awareness. In 2008, a record setting year, i-ENCON helped the Navy save more than one million barrels of oil and achieve a fuel cost avoidance of $136 million. Currently, i-ENCON has achieved a fuel cost avoidance of $99 million during fiscal year 2009.[83] However, there are mixed reactions to the program and as one program manager stated: "i-ENCON is sort of falling out of favor on the maritime side. On the aviation side, there are a few people who have said, "Hey, I heard the surface guys have this great i-ENCON program. Why don't we do something like that?"

Naval Sea Systems Command's i-ENCON initiative announced Oct. 19 that Navy ships realized a record 1.36 million barrels of oil in fuel avoidance during fiscal 2009. (www.i-encon.com)

The i-ENCON program uses a checklist (See Appendix A) that provides a periodic qualitative self-assessment of ship progress in following good energy conserving practices. There is a particularly strong focus on operational behaviors, cognitive factors, and incentives for conserving. The program also addresses communication, leadership, and attitudinal factors to some degree. This self-assessment is to be utilized by a ship's command to identify the areas where a ship needs better energy conservation practices for improved

[79] I-ENCON. "Navy i-ENCON program saves $79 million." Incentivized Shipboard Energy Conservation i-ENCON. May 20, 2009.
[80] I-ENCON. "ENCON in Brief." Incentivized Shipboard Energy Conservation i-ENCON. August 17, 2009.
[81] I-ENCON, May 2009.
[82] I-ENCON. "NAVSEA Program Helps Ships Set Record for Fuel Savings." Incentivized Shipboard Energy Conservation i-ENCON. December 4, 2008.
[83] Naval Sea Systems Command. "Incentivized Energy Conservation Program Realizes Record $99 Million Fuel Savings." Military Spot. August 6, 2009.

fuel economy by addressing specific conservation behaviors. These criteria may also serve as leading indicators for energy conservation.

Operational behaviors are emphasized

The i-ENCON program places its greatest emphasis on improving operational behaviors to reduce energy use. Focusing primarily on fuel savings, i-ENCON emphasizes fuel and cost avoidance practices like under-burn (the reported fuel rates for the quarter that's below the ship class' average burn rate).[84] However, the use of under-burn measurements is somewhat controversial. Some COs, who have not won awards, noted that varying mission objectives seemed to have had more of an impact than energy use: "Some ships are assigned duty to monitor the coast of Somalia and they get a little box and they don't have to do but 2 knots for months on end…others go to one geographic area to sweep almost continuously every week." Another CO noted this variation and its impact on daily burn rates: "I have a relatively short sea and anchor detail and so I'm able to meet my daily burn numbers by having full power." This variation results in a certain amount of skepticism. As one CO put it: "To list the ships, from the best performer to the worst performer … I just discount it because I don't think it takes into account at all the types of operations that have been assigned."

To counter the effects of variable mission objectives, i-ENCON identifies a number of behavioral criteria that can lead to under-burn. Operational factors that are emphasized include more efficient sailing, more efficient engine use, optimized navigation practices, improved maintenance, and lifestyle energy reductions. More efficient sailing practices include behaviors such as trailing shafts and anchoring underway. More efficient engine use includes using the minimum number of fire pumps and using motor driven pumps. Navigation practices that are called for include avoiding shallow waters when possible and using minimum rudder angles. Improved maintenance practices include everything from cleaning hulls to the proper calibration of gauges. Finally, the i-ENCON program encourages general energy reductions such as the use of low flow showerheads and the minimizing the use of air conditioning. These operational behaviors can be used as a counterbalance to the effects of variable mission rates by serving as a leading performance metrics.

Incentives are the primary motivational tool

"The i-ENCON program is a good deal. Ships get money back; therefore, sailors benefit from improved lounges, berthing facilities and even engineering coveralls."

A ship's company is motivated to participate in i-ENCON's program largely due to the potential material incentives they receive. I-ENCON rewards those who lead in fuel conservation, selected from among underway surface ships, with special recognition and cash incentives up to $67,000.[85] In fiscal year 2008, 148 ships received incentive cash awards. Award money is routed to each commanding officer's discretionary funds, which are often used to buy items like damage control gear or to augment the ship's welfare and recreation programs.[86] Several of our participants commented on the benefits of i-ENCON incentives. One CO, when discussing the i-ENCON program, commented: "all of us understand that you can never have enough money, and it's nice to have a little more money that [allows] you [to] have discretion over what you can buy. I consider that a good incentive."

The program also addresses social incentives through quarterly awards ceremonies and individual commendations. These social incentives include SECNAV energy awards, notes in one's FITREP, DOE energy awards, top 5 pictures on i-ENCON web site, and top 25 list on web site."[87] These incentives cause the sailors

[84] I-ENCON. "I-ENCON Program Realizes Record Savings." Incentivized Shipboard Energy Conservation i-ENCON. February 20, 2009.
[85] Ibid.
[86] I-ENCON, May 2009.
[87] McCoy, VADM Kevin, Brian Persons, and Hasan Pehlivan. Naval Sea Systems Command. Shipboard Incentivized Energy Conservation (i-ENCON) Program. May 28, 2009.

to pay more attention to what they can do to get their ship a higher rank: "We're all ranked based on a point system, all the ships which submitted a package."

Information is a key component

"Well, I get a daily report…we compare the barrels that I burned the previous day to what's called the daily burn rate."(CO)

The i-ENCON program also uses information. The program uses training, the collection of usage data, and feedback on energy use as their primary cognitive interventions to improve energy conservation. First, i-ENCON calls for attendance at their seminars and training to help sailors understand how to use of their Ship Energy Conservation Assist Training (SECAT) software. This software allows ships to develop fuel consumption curves, optimum transit curves, and replenishment requirements. I-ENCON also provides educational outreach through their web site. Secondly, the i-ENCON program emphasizes ongoing collection of usage data, such as data on the use of fuel oil meters, acceleration/deceleration tables, and fuel consumption curves. Finally, the i-ENCON program recommends that participants closely monitor the impact of their efforts by tracking their fuel and water trends, and then using this feedback to calculate optimum speed curves that can be used for planning the ship's daily operations.

Leadership is encouraged to participate

"Without the involvement of the leadership on the Navy's ships, this program would not be as successful" (i-ENCON program leadership)

Leadership is another area that is recognized by the i-ENCON program: the i-ENCON "requires real commitment from ships' commanding officers, chief engineers and main propulsion assistants."[88] Leadership behaviors that are called for include a strong commitment by the ship's CO and senior officers. i-ENCON also calls for specific roles on ships, such as ENCON Managers and ENCON Review Boards.

Communication includes face-to-face, print, and web

"Hassan does a real good job of getting the word out." (Ship engineering staff)

The i-ENCON program is defined as a "Meet the Fleet" initiative to reduce ships' energy consumption. The i-ENCON program sponsors actually go to and meet Navy ship's leaders to encourage energy conservation. The program sponsors' primary communication is through routine meetings with ship operators to review specific fuel-saving procedures and to recommend quarterly awards for ships with the most fuel-efficient operations.[89] I-ENCON calls for a number of specific communication activities as a part of their evaluation criteria. Face-to-face communication practices include "All Hands" announcements for energy tips. I-ENCON also provides individual feedback on each ship's energy use, and notices of cash awards given to energy conservers. Finally, i-ENCON also calls for ships to submit SECNAV Annual Energy Award packages to OPNAV & NAVSEA. In addition, the program has a website and posts articles to several Navy publications such as NAVSEA's media publication *On Watch*, NAVY.mil, and Military.com.

Attitudinal factors appear to play a minimal role

The i-ENCON program uses awards as a key part of their program. They offer "Top 25 Ships" honors to top energy reducers and are pushing for regular commendations by the SECNAV. These two social incentives are the only attitudinal factors that are included in their list of ENCON criteria. A deeper study of the classroom training may reveal the use of more attitudinal interventions.

[88] I-ENCON, May 2009.

[89] Naval Sea Systems Command, 2009.

In conclusion, the i-ENCON program provides a useful model for encouraging energy conservation. It clearly establishes operational outcomes that may be useful leading indicators for energy reduction. It provides effective material incentives for encouraging conservation behaviors. It reinforces the need for information and feedback on usage. And, it addresses the importance of institutionalizing conservation through strong leadership and on-going communication. The i-ENCON program could be enhanced by expanding its efforts to include stronger attitudinal interventions such as social incentives.

Shipboard Energy Management and Cold Iron

The Shipboard Energy Management and Cold Iron program (SEMCI) is a continuation of a successful pilot study in Navy Region Southwest that was done to determine the feasibility of reducing utilities costs and consumption aboard ships in port during cold iron periods.[90] Ships sitting in port connected to shore power are identified as "cold iron." These ships are consuming utilities when they are tied up to the pier even though they are not operating. The Utilities & Energy Program manager in Navy Region Southwest and his Shore Energy Team were tasked by the Assistant Secretary of the Navy for RD&A to run a pilot study on these ships. The study officially began in January 2007 and ended at the end of fiscal year 2008. The focus of the study was to work with the ships to see if they could reduce the electric load while in port.[91] Even though the pilot study was initially only funded at $384,000, it did produce some good results. [92] For example, the study showed that Destroyers or Cruisers routinely achieved 200 to 400 kilowatt reductions by just turning off the AC, compressors or redundant fire pumps. By taking such actions, larger ships actually achieved 500 to 700 kilowatt reductions.[93] The program is still being run by the Remote Energy Managers (REM) at Navy Region Southwest and has not been expanded to other ports due to the lack of metering on the piers at other ports.

A nuclear aircraft carrier such as USS Ronald Reagan (CVN 76), shown departing Naval Base Coronado, can have peak cold iron electrical demands of 10 to 14 megawatts (MW), roughly equal to all the shore facilities at the installation. (Energy Saving Ideas, Navy Region Southwest, 30 January 2008, No. 132)

The key obstacle to the SEMCI program is getting on-going funding and support. According to one of the program managers, this support needs to come from the fleet operators: "We're just shore people that are kind of dabbling in this. In my opinion, this program should be turned over to the operators so that the very people who are overseeing the ships in port on maintenance and that kind of thing can take this program … it should be in the hands of the operators and then it would be more formalized."

Operationally, the SEMCI program sees its primary success as being dependent on increasing awareness of usage through shore side metering and data visualization. In addition, the program managers acknowledge the need for supporting leadership and the effectiveness of using peer-to-peer communication.

[90] Duke, 2008.
[91] Lindsey, Bernie. Interview by Anita Salem. Utility & Energy Program Manager (July 17, 2009).
[92] Duke, 2008.
[93] Lindsey, 2009.

Existing programs

Providing awareness and feedback is key

"Sailors are just like the rest of us; they go home and they read the newspaper and they see the news."

The SEMCI program focuses on three key cognitive areas—informing ships of energy savings opportunities, monitoring and visualizing energy use, and leveraging the current energy crisis to increase awareness.

A core function of the SEMCI program is to evaluate opportunities for energy savings while ships are in port. They do this through the use of Resource Efficiency Managers (REM). These REM teams are experienced mariners who go out to ships and work with the engineering staff to help identify areas where there are opportunities for reducing energy use. They identify redundant equipment and areas where equipment can be turned off when they are not in operation.[94] The REMs also help ships learn how to analyze metering and billing data for anomalies and how to track the use of energy.[95] By increasing awareness, the REMs hope to reduce energy use while ships are at port.

A second function of the SEMCI program is to provide quantitative feedback on energy use through the use of shore side metering and Supervisory Control and Data Acquisition (SCADA) systems. A SCADA system is a computer control system that monitors and records utility usage.[96] San Diego was used as an initial site because they have an elaborate SCADA system to collect the utility data.[97] This system allowed the team to gather data showing how much energy each ship was using while connected to shore power. They were then able to compare the ship's energy usage before and after the REMs came aboard the ships. However, this is a difficult task because of the varying conditions on shore. As one engineer noted: "But with hundreds of people still living on the ships and [because] they're operating every day, the fact is that the loads go up and down." Nonetheless, when you look at each individual ship, the SCADA data can show you the impact of energy reduction behaviors. For example, in Figure 1 the SCADA data shows the average use of one ship(solid trend line) before REM (red) at 1900 KW and the average use after reduction activities (blue) at 1100 KW.

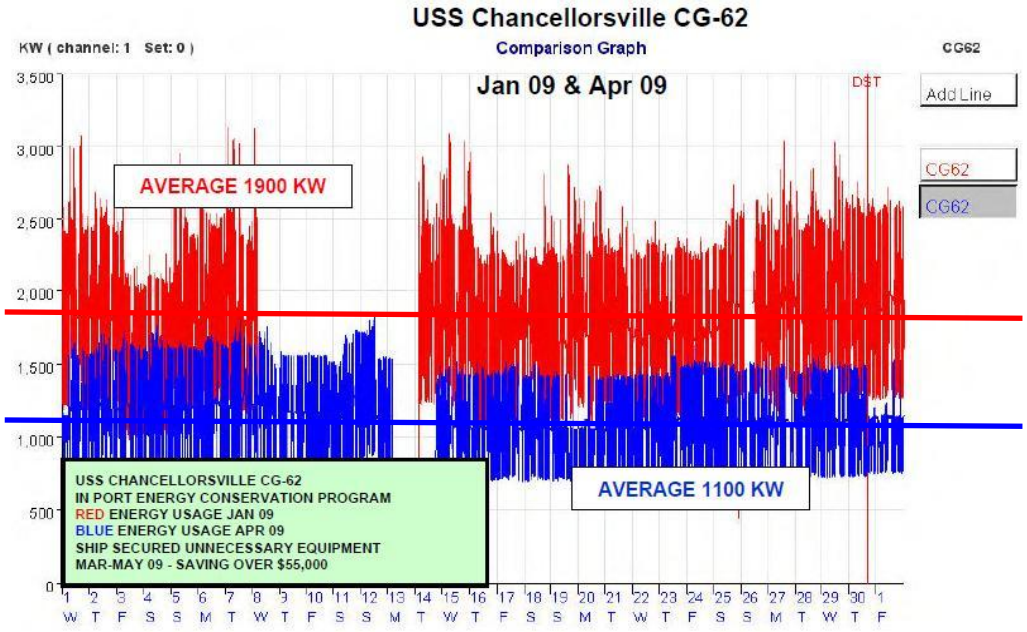

Figure 1

[94] Lindsey, 2009.
[95] Duke, 2008.
[96] "SCADA." Wikipedia. August 31, 2009.
[97] Lindsey, 2009.

Existing programs

The Shore Energy Team believes that their ability to show the impact of specific conservation behaviors was a key factor in their success, leading to a recommendation that the program be continued in San Diego and expanded to other ports. However, the program faces skepticism because of the relatively small savings when viewed on a per ship basis. As one participant noted, "part of the problem is we are achieving savings on a per ship basis for short periods of time." Program managers argue however that the savings are impressive when seen cumulatively: "we can produce graph after graph after graph… that we have … between $50 million to $60 million in savings."

The participation of leaders is a key factor

"It's amazing how people on the ship, both at the deck plate level and chief engineer, embraced us when they were told [to do so] by their leadership."98 (SEMCI program manager)

One of the key factors in establishing SEMCI was the participation of senior leadership from the maritime forces. With the Commander of Naval Surface Force's backing, both commanding officers (COs) and Chief Engineers opened up access to ship and port plants and needed personnel.[99] As one sailor stated: "People on ships are stretched pretty thin. There's a lot of work going on and … certainly other programs and other requirements that they have, so for them to spend any amount of time, it's an important thing." Still, even though the program was highlighted by the Commander of Naval Surface Force, it was not very visible to our participants. As one ship CO noted: "There was some chatter about they were going to start measuring our kilowatt usage when we were using shore power, but I haven't seen anything of real effect there… it never came up to my level again."

Peer communication is important

"The REMs expertise is shipboard engineering … they understand the maintenance cycles of the ships."

Face-to-face communication by peers is considered a key factor in the success of the SEMCI program. Faced with historical divisions between military and civilian personnel and between shore and sea personnel, the SEMCI program decided to employ retired Navy personnel.[100] Because they are familiar with a shipboard environment, these retired Navy personnel were used to ease the communication with the chief engineer and the senior people under the chief engineer.

Operational behaviors are emphasized

The SEMCI program focuses on operational behaviors specific to Cold Iron ships. The operational areas that they are concerned with include plant and engineering systems and decommissioning processes. Specific behaviors include the use of auxiliary plant systems such as lighting, air conditioning, seawater fire pump systems, motor generators and compressed air systems. The SEMCI program also looks at the processes surrounding the decommissioning of ships and the use of barges.

Attitudinal factors appear to play a minimal role

Interviews and research on the SEMCI program did not uncover any explicit use of attitudinal levers for changing energy behaviors while at port; however, there were some indirect references to using a more attitudinal approach. For example, one program manager offered that complete ownership by fleet forces might be an appropriate option: "In my opinion, this program should be turned over to the operators so that the very people who are overseeing the ships in port on maintenance… can take this program and … then it would be more formalized." This kind of ownership could inspire a different attitude toward energy usage.

[98] Lindsey, 2009.
[99] Ibid.
[100] Lindsey, 2009.

Existing programs

In conclusion, the SEMCI program is a good example of how feedback on energy use can be effectively used to motivate energy conservation behaviors. In addition, it provides a model of peer-to-peer communication that may prove beneficial to others. Finally, as the program manager noted, leadership will be more motivated to use the program when the financial incentives go directly to the "hands of the very people who are paying us the utilities."

Findings

Findings from the field

In addition to our review of relevant research and our evaluation of existing energy conservation programs in the tactical forces, we also conducted a series of interviews to uncover the key psycho/social factors that may impact strategic communication efforts in energy conservation. To help us answer these questions, we looked at stakeholder comments in light of six key change factors: attitudes, information, motivation, leadership, communication, and operational behaviors.

Increased awareness drives energy conservation

A key driver in energy conservation is an awareness of the need to conserve. For our study participants, three key areas included an awareness of the high costs of fuel, awareness of the impact on defense capabilities, and awareness of the environmental impacts. These cognitive factors should be leveraged in all themes and messages.

There is an increasing awareness of the high cost of fuel

"There's been quite an awareness campaign that we have felt with the drastic reduction on our daily burn rate allowed by third fleet." (Ship CO)

Most operation and command participants acknowledged the impact of fuel use on their budget. One program manager noted that this awareness is across the tactical forces: "We've been facing some financial shortfalls in FY09 at the fleet level because of some reductions in wartime supplemental funding from Congress, so we have had to cut back in both the flying hour program for aviation and to steaming days for ships." A recently appointed aviation CO became even more aware of the cost impacts: "I've just taken command and as I'm going through my series of in-briefs and getting these briefings on what my budget is and what we're spending it on, and there are some really amazing things about how much money we're spending on energy." For the fleet forces, the connection was even more obvious because of the recent forced fuel reductions. As one CO commented: "we've lost money to provide fuel to the fleet, in part due to fuel price variability." An awareness of the cost of fuel was perceived at the personal level as well. As one ensign reported: "I used to drive a big old jacked-up car and a tank of gas would last 3 days and I'd fill it up with 80 bucks. I've got a little tiny Cobalt now. I fill it up once every 2 weeks and it's $25… it's well worth it …. I wouldn't be able to afford to actually live off the boat if I still had a truck." In the aviation operational commands, this impact was not as strongly felt. As one aviator put it: "To be honest, I don't really care how much I burn or how much fuel you dump…There really isn't any concern at all for conservation when you're flying, other than your personal management of your fuel on your aircraft." However, as fuel costs more directly impact aviation budgets, the awareness for the need to conserve may increase. One CO recognized how increased costs could impact his ability to maintain readiness, particularly in an era of rising fuel prices: "…if gas goes back up to $4.00 or $5.00 a gallon … we're still going to have to figure out how to train and do all of these things, but we're not going to have the resources to be able to do them."

There is some awareness of the impact on defense capabilities

"If you can inoculate people with the idea of stewardship and that this is my money and I need to make it last...that is where there's the greatest potential of payoff." (CO aviation)

A few participants recognized the impact that fuel has on the nation and its security. As one Ship's CO said: "Hey, we've got to reduce foreign oil dependence." One junior officer noted how energy is more readily connected with national security by younger sailors: "these young sailors, a lot of them are very conscious of the dependency on foreign oil." Several participants also noted how the economy was not doing very well and how fuel costs and personal responsibility were important: One participant said, "We all have a

responsibility to be smart in how we go and spend our money," and another noted, "Saving a dollar is much better than just wasting it for no reason." One CO called for a new sense of stewardship over our resources: "I've got to leave this [command] better and be frugal and be accountable for how I handle these resources…I think it [energy wasting] is just wrong because one, the taxpayers are the ones who have provided the resources for us and, two, we are the taxpayers."

There is some awareness of the effect on the planet

"I'm a greenie so I am always about trying to do more for the environment"(Ship engineer)

Several maritime participants expressed enthusiasm about conservation, stating how lowering consumption is a good practice in general: "I personally believe that we do need to reduce our fuel consumption [and] our oil consumption, so I think anything that can go and do that across every single sector of our society is a good thing." He added that this awareness of consumption is increasing: "People are becoming more aware of how wasteful we are." Some participants also saw conservation as just the right thing to do: "I'm a believer in global warming and stuff like that, so I think part of what the Navy needs to do, along with the rest of the government, is be greener … reducing our fuel consumption is a good strategic goal for the Navy, period."

Information on energy usage can improve conservation efforts

Several participants noted the importance of stating clear goals for performance and seeing the results of their conservation efforts. Setting, communicating, and tracking performance goals is a key component in strategic communication efforts.

Clear goals can help conservation efforts

"The Recovery Act and the Energy Independence Security Act of 2007 … really set the real-time current goals that the federal government drives toward." (Program Manager)

The primary performance goal that was mentioned by participants was the mandated 10% reduction in maritime fuel costs that was initiated this year: "They [Third Fleet] started by lowering the burn rate and then said we're going to do a 10% reduction [from the reduced burn rate] … so, it actually ended up being quite a bit more than 10%." In response to this reduction, Ship COs adapted their procedures: "I'm more sensitive to time distance, as in how can I get there without going fast? … I can go to single shaft ops and conserve fuel." One CO recognized how important mandated goals were in changing behavior: "We kind of needed to get shocked into and challenged to meet what we thought was an unrealistic number in order to truly achieve what was within the arc of the possible." However, for aviation, goal-setting for conservation was in conflict with their goals for maintaining readiness. As one aviator said: "So you can cut 10% all you want, but the bottom line is that somebody has to say they don't want a squadron to be at a certain readiness level at a certain point."

Feedback on usage can increase conservation

"There has to be some sort of feedback loop without retribution." (Ship engineer)

Feedback on on-going energy use was another factor mentioned by participants. For instance, the use of a SCADA system to monitor electricity use was an effective tool for the Shipboard Energy Management program: "In San Diego we have a very elaborate SCADA system here and we collect utility data. All of our buildings are metered, the piers are metered, and we collect the data so you can see it in real time…this is what your previous load was and this is what the load has been during the last week or two weeks." The i-ENCON program also forces ships to track their usage, which results in operators reducing fuel consumptions: "I get a daily report…we compare the barrels that I burned the previous day to what's called the daily burn rate…the most significant way for me to reduce consumption is on the fuel consumption side of my main

engines." By tracking energy use, participants can make informed decisions. One engineer pointed out how fuel curves can help improve ship efficiencies: "We are trying to develop fuel curves. That way we can find out what is our most economical plant line-up." Seeing results also helped participants see that the goals are attainable. One CO stated how "it's successful because first, it was pretty difficult and [second], it was a matter of just showing that you could do it." Another officer noted the importance of accountability to goals, emphasizing that you need to "show them that whatever promises or goals you set to achieve" you actually follow through on.

For aviator participants, there was a desire to get information on how to balance flight costs, energy use, and training goals. By understanding the impact on energy use, aviators are better equipped to adjust their fuel usage to accommodate specific training needs. For example, one aviator said, you could "run the intercepts as best you can realistically for training" but that, for example, "once you make a merge and the intercept is over," you could then "throttle right back to max conserve of fuel to reset for the next one."

The Navy culture impacts conservation efforts

In the Navy, there are some ingrained beliefs that impact conservation behaviors. Beliefs that surfaced during our interviews include competitiveness and personal responsibility. Beliefs that are resistant to the adoption of conservation behaviors include the emphasis on mission goals and readiness, the warfighter culture, and general risk avoidance. Strategic communication efforts should leverage attitudes that support a conservation goal and explicitly address attitudes that are resistant to conservation messaging.

The competitive spirit can be a positive influence

"I think that the military has an opportunity here to be a great example because we can move faster than I think typically a state can"(Staff)

Participants expressed a pride of service, can-do attitude, and a belief in their competence. We heard participants talk about how important it is to have pride in their work and be recognized for it. One aviator talked about how in their impromptu contacts, they focused on friendly competition in energy conservation: "Competition, having fun, skill, pride, [and] some kind of reward makes it even better. Bragging rights." We also saw some examples of the Navy can-do attitude. One CO voiced his pride over being able to meet new burn rate quotas: "We were able to meet the number … we work really hard and we take every opportunity we can, and I'm getting all my training done … [without] exceeding my daily burn rate, so it's certainly do-able." In addition, there's a belief in their own competence. This was especially evident with aviation participants: "Naval Aviators are very intelligent, smart, hardworking people, and if there's a way to do things better, they'll find a way to do it."

Buy-in and personal responsibility are important

"So the thing that I think is really important is that we've got to change our culture from a culture of consumption to a culture of stewardship." (Aviation CO)

Many participants recognized the importance of getting individual support for Navy conservation efforts in order to create a culture of stewardship. This support, as one participant stated, should include the entire organization: "You want the full buy-in of the program down to the individual aviator." Communication efforts should be direct and include a wide range of benefits. One participant called for direct communication that exposed the reasons for conserving: "I think it would resonate with them [the crew] if you talked about overall savings both in terms of money and then in terms of natural resources not expended." Encouraging staff to become more aware and participate in conservation efforts can result in innovative ideas for energy conservation. For example, one aviator pointed out the importance of taking responsibility for reducing fuel use: "People are more aware [that] if we don't need to do 24 knots, let's not do it because it burns way too

much fuel. We'll just do 15 [or] 16 knots because it's more economical." In naval operations, we also heard suggestions by operational staff of where fuel might be conserved: "Stripping tanks is a big one. We waste so much fuel doing that, actually."

Mission goals and readiness outweigh conservation goals

'You need to fly planes, [and] drive ships and submarines to build experience and ensure readiness." (Ship CO)

Consistently in our interviews with maritime and aviation leadership, the concept of meeting mission goals surfaced as a counter to their willingness to conserve energy. One area of resistance was about training and readiness. For maritime, time at sea is a critical readiness component. One CO noted this balancing act: "We can't drive our ships being ignorant about how much fuel we're burning, but at the same time we need to get back the (training) days we're losing." In addition to sea time, maritime personnel were cautious about sacrificing readiness for reduced energy use: "I can either go 16 knots with 1 generator or 12 knots with 2 generators. The problem with the generator solution is I really can't do anything of significance with my combat system on only a single generator." For aviators, flight time was a key readiness factor. One aviator, in describing the substitution of simulators for flight time, noted a key point of resistance: "Hearing we're going to cut your flying hours and you're going to have to use the simulator more… It's generally a turn off to Naval aviators."

The war fighter culture can be a barrier to energy conservation

"I think that first off we're going from a culture where the CO is the war fighter and a little bit of 'Damn the torpedoes, full speed ahead! Damn the cost of the fuel, full speed ahead! (Ship CO)

Participants frequently spoke of conflicts between conserving energy and their perceptions of the role of operational forces. In addition, a general attitude of independence surfaced.

For both maritime and aviation, a sharp line was drawn between Navy and commercial activities. One CO commented on the importance of speed: "Sometimes for me being slow at sea just looks like we're just a merchant. Well, we're not merchants." An aviation participant also vehemently pointed out that applying commercial practices in the Navy was not practical: "There are differences between commercial and tactical aviation!"

In addition to resisting comparisons to commercial navies, our interviewees revealed a strong sense of autonomy. One CO pointed out the independent role that operational commanders play: "This is a very sensitive subject because operational commanders are tasked with conducting operations and especially here at Naval Air Forces we shy away from telling them how to do business." Another CO explained how he operates: "I get a pretty wide range of autonomy to employ my ship as I see fit." This autonomy extends to other command officers. As one Commander said: "I mean, the bridge thinks I'm crazy sometimes, if we've got nowhere to be and we're just out overnight but there's no convenient anchorage … they will continue to creep the speed up to what they think is very slow—5 or 6 knots, but there's a significant savings at going only 2 knots for that time, so I'll call up and say I want bare steerageway (the slowest speed required to control the boat)."

Risk avoidance is a roadblock to energy conservation

"Energy conservation makes sense, but we have to be really careful in terms of what risk we assume and how it sacrifices readiness." (Fleet Forces officer)

Participants repeatedly evaluated risk when deciding whether or not to do specific energy conservation behaviors. We saw that even when a CO is willing to modify his processes to conserve energy, he still does so

in terms of ship safety: "I feel like my engineering team can start a stand-by engine quick enough and get way back on the ship. So, I've never felt that I've compromised the ship's safety in the name of ECON." This risk of floundering was a key concern for our maritime participants and impacts their willingness to reduce energy. For instance, one CO decided against shutting off unused engines because of the perceived risk: "Shutting off engines on a gas turbine ship is a possibility, but on a steam ship it is not practical because of the plant recovery period." Another CO considered the risk of losing equipment when considering energy reductions. For example, one CO noted that if he were to take certain energy conservation measures, he might "not be taking the absolute safest possible course of action. For example, when you're streaming the tail [towed array sonar], one of the dangers is to lose way on the ship and ground the tail." On shore, there was even a perceived risk to sailor safety from lowering light levels. As one CO put it, "I wouldn't want to reduce lighting at night by 50% and reduce the lighting on the piers just to save energy because it leaves us vulnerable potentially to additional force protection risk."

For aviation participants, safety was also a key factor. One pilot noted that safety should dictate the "absolute minimum amount of fuel" that is kept on board. This safety consideration, as noted by our participants, is not a simple matter: "Safety is going to dictate that [conservation behavior], and there are a lot of different variables that will derive what that fuel level is." One of these variables is the impact on landing gears. As one pilot noted: "you'll commonly see lots of F-18s flying overhead dumping fuel [and] adjusting weight because they are about to land," he said, adding that if the plane has too much weight when it lands, "you'll break the arresting gear." Additionally, not all weight-saving measures are equal when creating a safety margin. One pilot noted that comparative costs were also a factor: "Bombs cost more money than the fuel," he said. Given the weight restrictions, the aviator has to make choices: "It's a tradeoff of either the ordinance and/or fuel. If you keep the ordinance, that means that you dump fuel." Another factor that can lead to fuel waste is the operational pace. As one pilot put it: "One of the challenges of carrier aviation [is that] your airport [the carrier flight deck] is not always open … based on carrier operation, we all take off virtually at the same time and then all land within ten minutes of each other," he explained. Regardless of what each plane does operationally, they all have to land at roughly the same time, so "some planes need to dump fuel to meet landing requirements." Finally, aviators have a wide degree of latitude when making individual assessments of risk, as exemplified in one pilot's comments: "Some aviators, even though it's not required, will use an afterburner during takeoff … it's kind of hard to just step in and say, 'Don't do it,' because there's a safety issue involved with that under certain takeoff conditions, so it's kind of a touchy subject with aviators."

Material and social incentives impact behavior

Our interviews uncovered several incentives that impacted our participants' willingness to conserve energy. These incentives included explicit mandates, the use of material incentives, an alignment with efficiency goals, and the use of social incentives. Any change effort should include a broad scope of incentives that align with stakeholder needs.

Mandates and quality leadership increase energy conservation

"When COs say to do something, there isn't a lot of debate about it. So you only have to convince one person to affect the change." (Ship CO)

Participants recognized the impact that the Navy's command-control system had on their behavior, as well as the importance of good leadership. The Navy command culture has an important role in changing behavior, and in our study participants expressed a reluctance to get in trouble, along with a belief that orders drove a good part of their behavior. This was especially evident at the operations level. Ensigns and Lieutenants that we spoke to responded that they did what they were told and followed procedures, regardless of energy consequences. For example, one participant, in discussing how he is forced to dump fuel when cleaning fuel

tanks, noted: “Fuel stripping just for the sake of following procedures is wasteful. The one chain of command was focused on following procedures therefore we stripped fuel tanks (whether they needed it or not)... The chain of command I’ve got now it’s by-the-book—I’m sorry, yeah, we’re going to waste some, but it says do it, so I do it.” It was clear in our interviews that the role of the CO was key to conservation in the operational layer. It was also clear that COs also have to follow orders from their superiors. As one participant stated: “I never had a CO come up to me and say, ‘Hey, I really feel good about what I’m doing for the environment or what I’m doing for the budget,’” he said, adding that it was really about doing what they were mandated to do: “we’ve been given an order and we’re all executing it.” Finally, leadership mandates were a bottom-line reason for responding to calls to reduce energy. One participant had a simple response to what drove them to cut energy usage by 10%: "The Vice Admiral, Commander of the Third Fleet.”

It was also clear from our participants that support for energy conservation needed to flow through the entire chain of command—from policy development all the way to the operational, enterprise level. One program manager noted the importance of having a high-level strategy: “Should we have a Naval energy strategy or not?—I don’t think this conversation would be happening [without it].” To ensure the effective rollout of policy, participants called for a comprehensive approach that was sustained over time. For instance, when asked what was a key factor in conserving energy, a program manager responded: “Well, help figure out a way to get a culture where it’s rolled out … then, the key is passing ownership of this.” In our interviews, one of the ways that ownership is encouraged was through threat of reprisals. As one junior officer stated: “We work for the main propulsion assistant, so all we’ve got to do is say, hey, Ma’am, this is not being done correctly and she brings the lightning bolts down from the sky on everybody.” This fear of reprisal is also true for COs. One CO, when asked to describe what motivates ship’s Captains, replied: “Not getting in trouble."

The role of leadership seemed to play less of a role for our aviation participants. For aviators, readiness requirements dominated their discussion: "We’ll do whatever the training matrix requires us to do. You have to meet a certain wicket at a certain point in time. If you don’t meet that wicket, you’re going to get in trouble." However, one aviation leader still saw his role as enforcing energy conservation: "I am going to hold them responsible and hold their feet to the fire for being good stewards."

Material benefits can incentivize conservation behaviors

"What seems to motivate people the most right now is the money.”(Navigator)

There are a variety of material benefits that surfaced as possible motivating factors in energy conservation. First, money directed towards consumables is an effective motivator for those participating in the i-ENCON program. However, it is important that a strong connection be made between money received and personal benefits. As one skeptical CO noted: "we’re supposed to get some of the money back, but one, I’ve not seen it; two, I’m not sure how [to make that visible]. I think ship budget is kind of esoteric to my crew." In aviation forces, participants indicated that financial incentives might help motivate fuel savings by providing other material benefits. One pilot mused that financial rewards could fill the gaps in other needed areas: "let’s say you save X amount of money on your fuel cost, you could you turn around and use that money for other needs the squadron has in terms of tools for maintainers, or flight gear, or new computers.”

As noted above, material benefits should be tied to specific improvements. Our interviews indicated that both lifestyle and efficiency improvements can be effective motivators. Lifestyle improvements include benefits that increase comfort, lessen work load, and offer personal perks. For instance, a CO noted how comfort was a key motivator: “(With i-ENCON), sailors benefit from improved lounges, berthing facilities, and even engineering coveralls.” In addition, one deckplate participant noted that a reduction in workload was also of benefit: “It (fuel stripping) decreases the amount of man hours we have to put out to keep transferring fuel

because it can take us anywhere between 2 to 4 hours." Finally, personal rewards were offered as one type of material incentive. One aviator recommended that money saved could be partially redirected to individual rewards, and offered the following example: "if we can save some money across Naval Aviation, we [could] expand the air show list and let you guys go to more air shows."

Efficiency outcomes align with conservation efforts

"There's your incentive—efficiency within your own command."(CO)

Improving the efficiency of operations and refocusing resources were important incentives for participants. One CO noted the importance of having the right efficiency measures in order to increase conservation: "If we could just get the right measures…not the culture of just sorties flown, bombs dropped, hours flown, a consumption kind of mentality. … It's not the fact that you fired the bullets…but did the gun work and did the bullet hit the target?" The aviation participants in particular felt that anything that helped them prepare and train more efficiently was a benefit: "we're down to the minimum it takes to be able to adequately train and prepare for deployment. I think that's one of the biggest influences we've got right now for driving an energy efficiency culture here in the tactical community." This focus on more efficient use of training was very strong for aviation: "We've got to figure out ways to more imaginatively prepare our people with the same level of performance if not higher, but have fewer drills or more effective ways of creating the same stimulus and response in the training environment." For maritime participants, more efficient maintenance was key. One CO, when asked what would motivate him to conserve fuel stated clearly: "more time and money for maintenance would be an incentive." Maintenance challenges surfaced with other COs as well: "We can get all the maintenance time in the world, but…if we're sitting here waiting on parts that we can't order because we don't have the money, the time's not going to do us any good."

Peer pressure, recognition, and personal pride can be used to increase conservation

"That's what makes their commanding officer look great and their operations officer look great." (Pilot)

In addition to material benefits, participants identified a number of social benefits that could be used to incentivize conservation behaviors. First, participants recognized that the opinions of their peers impacted their own perceptions of the value of conserving energy. As one junior officer noted: "There's a couple people in my chain of command that are real enthusiastic about it; their enthusiasm rolls over to us, and we see something they want to be a part of and they push it on us, and most of the time we want to be a part of it, too." When asked about other successful change efforts, participants identified peer pressure as important levers for change. One junior officer recalled an anti-drunk driving campaign that was successful because of the social pressures that were used: "there's a policy now where people are set up into teams, and if one person on that team gets an alcohol-related incident, then everybody on their team loses what would have been a day off. So, instead of it being the leadership making the decision, it's coming from the sides, from their peers."

Second, being recognized as a high performer can add to increased motivation: "Positive attention and social recognition for energy conservation would provide motivation to the sailors. i-ENCON offers recognition at the SECNAV level, it comes with SECNAV awards and posting to websites, plus a whole host of other things that don't require realignment of funds … I think [that] sends the right message to the units that they're doing good things and they're being recognized for the fact that they're conserving fuel." Another sailor noted how being recognized as a low performer can also have a motivating effect: "The Navy Safety Center also published all the bad boys stories, so when somebody did something stupid, they were really called out."

Finally, participants noted how their self-image can come into play when deciding whether or not to engage in conservation efforts. One engineer, when asked what drives him to conserve energy, pointed to his general

conservationist attitude: "Usually just my own personal drive, just to do it…that's kind of how my family's always been. We've always kind of recycled, always been really good at conserving everything."

Existing communication efforts need strengthening

As fuel prices increase, there is going to be growing pressure to really get this in the forefront of people's minds. As it currently stands today, there's not a lot of common communication. (Ship CO)

In our interviews, we heard very little about current communication practices, indicating that there is a gap in strategic communication efforts. Those efforts that were noted, however, included i-ENCON reports, face-to-face communication, targeted appeals, and feedback on the results of conservation efforts. Existing communication preferences and practices can be used to further develop strategic communication plans.

Communication channels are limited

There were very few media sources mentioned for hearing about energy conservation. Several participants commented on the use of the i-ENCON energy conservation manual and ship fuel usage reports. Only one participant noted a specific media source (Current Magazine): "I'm a 'greenie' so I'm always about trying to do more of the environmental stuff, but that's not really a big paradigm in the Navy. So, I like Current Magazine and those kind of things."

Face-to-face interactions are desired

An important factor for many participants was face-to-face personal interactions. When asked about other successful change efforts, participants noted the importance of including the entire team in the communication process. One engineer recalled a safety initiative that was successful because of integrated and personal communication: "Well, for one, it got the entire command involved… We had to actually sit down with the CO and the entire engineering department and say, okay, here's your safety stand down. This is what you're supposed to be doing … and they're going to be there with you until the very end of it ... to insure that you're actually doing it correctly."

Targeted appeals are useful

Also key was the use of communication that included personally targeted appeals. One sailor noted the importance of making the benefits personal: "So, if you tell all your people that work for you, 'hey, guess what, if we can cut our fuel cost this much, we're going to get this much money back,' well, 'what does that mean for me?' 'Well, it means we're going to get new berthings' and … you'd go, 'oh, okay, that's great for me.'" Another engineer commented on the importance of translating savings into greater operational flexibility: "We don't have enough money to go steaming, so we better be economical in what we're doing to try to conserve it so we will have it later on in the year, for example ... I think that's one of the biggest influences we've got right now for driving an energy efficiency culture here in the tactical community."

Specific feedback on actions is needed

Participants also noted that personal appeals need to include specific feedback on their actions. For instance, one CO commented on the importance of getting a specific 10% reduction order as opposed to a general request to conserve: "Cut it by 10% and you make it work. That gets my attention as opposed to, 'Well, we need to go out and conserve fuel." In addition to setting specific goals, participants acknowledged the importance of getting feedback on their progress to that goal. As one navigator pointed out: "Daily we submit what our fuel consumption is, but now…we compare the barrels that I burned the previous day to what's called the daily burn rate."

Findings

Technological solutions are valued but slow

"We need a long-term reduction in fuel consumption or energy consumption in terms of how we design things, build things, shore infrastructure, the ship." (Ship CO)

Participants were aware and supportive of several existing and proposed technology applications. However, participants were also skeptical of the slow pace of change when considering technological solutions. A strategic communication plan should include processes for collecting ideas on new technology solutions and gathering feedback on the practicality of implementation.

Our interviews uncovered a number of technical solutions that were seen as valuable:

- Auxiliary propulsion units
- Solar power
- New ship designs
- Cleaner hulls
- Controllable pitch propellers
- Improved planning tools

In addition to commenting on potential solutions, our participants noted that technological solutions tended to be long term and costly. One Program Manager noted that this was true for both ships and aircraft: "To retrofit ships with the new technology is a slow process, and the same thing with procurement of aircraft." The slowness of the acquisition process was also seen as inhibiting the perceived effectiveness of conservation efforts. As one program manager explained: "It's pretty hard to see short-term returns on a lot of the issues we're looking at…If you've got a new aircraft engine or …burn fuel made from algae, for example, that's a good experiment, but it's hard to implement on a wide scale quickly."

The program that had the highest visibility for the air forces was the use of aircraft simulators. Simulators were seen as a valuable tool by program staff: "So the first thing I'd do is fund good available modern simulators and really push those for utilization." However, there was a good deal of resistance about using the technology. Pilots complained of poor scheduling and the resulting lack of availability: "There are only a certain amount of times that the simulators are even available to use." In addition, those that are available are not perceived as being up-to-date: "The simulators that we have here up until just a couple of months ago are not representative of what the airplanes are that we're actually flying." Finally, participants also felt that simulator training just did not adequately prepare them: "But you can't ask a guy to go fly in the simulator for two or three months and fly one or two times in a real airplane and come back and use the simulator and then go on cruise."

Process and policy impact conservation

Energy conservation efforts are impacted by DoD and Navy policy and processes. Some of these policies and processes support energy conservation efforts and some are barriers to increasing energy conservation. Key enablers include mandated reductions and incentives. Key barriers include the budget process, procedural complexities, the lack of conservation criteria in promotions, organizational difficulties, and process gaps. Strategic communication efforts should include processes for gathering practitioner feedback on the policy and process factors impacting energy conservation programs.

Policy and process enablers

There are three key policies and processes that participants identified as supporting conservation efforts. First, participants recognized the value of material incentives. Specifically, participants believed that the

SECNAV awards and cash incentives were helped incentivize energy conservation. Second, participants acknowledged that the mandated 10% reduction in fuel usage was a significant motivator for their conservation efforts. Finally, one program manager stressed the importance of having an enterprise focus for all conservation efforts.

Participants also identified several processes that could be improved when designing best practices in energy conservation. These practices include:

- Efficient use of runways
- Improved air traffic control
- Increased landing weight allowances
- Delayed light burning
- Better route planning
- Better tanker configurations
- Tracking of fuel use
- Generators built with 10% buffer on technical requirements

Policy barriers

"It's seen basically as a bad thing as an ops officer in a Hornet squadron at the end of the fiscal year if you give back money because you didn't use it" (Pilot)

During our interviews, participants noted budgetary, procedural, and promotional barriers to conserving energy.

First, the DoD funding process does not support conservation efforts. Participants noted that naval operations were often protected from the direct impact of budget shortfalls. One aviator talked about how in the past when the budget ran out, money was still available: "usually if you go over that target you can get more money…The money will come. It always seems to come from somewhere." At the opposite end, an aviator described how unused budgets are rarely returned to the funder in order to protect next year's budget, even if it means expending resources such as fuel: "From a squadron perspective, you're given a set amount of money and you have to get within 1% of that amount, [so] you have to burn it [fuel]." Another aviator also commented on the practice of fuel dumping: "My ops officer had his fuel dumps on [and] what he was focused on was that he had to use up the fuel…He felt like he had to get rid of or use up all of his gas money and gas for that fiscal year." Sometimes, however, extra end-of-year funds can be used to improve training and readiness. In a similar circumstance, another officer chose to use the extra fuel for additional training: "I was coming back from a sortie [after] training and now we were coming back. It was at the end of the fiscal year in September and we had more gas money than we had airplanes to fly," he said, so he added training time: "we needed to get the best training that we [could] get out of this." Several participants noted that it would be helpful if they could move funds between groups in order to shift to missions or groups that needed more training, but that stove-piping made the moving of excess funds difficult.

There were also a number of procedural issues that surfaced during our interviews. These procedures limited conservation efforts by making it more difficult to reduce energy use. For example, one aviation CO noted the inefficient use of training aircraft: "We've used gray airplanes to do red air training and [as a result]…we've used up the life of the operational planes more so than we would have. So there's a conservation step right there."

Specifically, participants noted the following procedural barriers to energy conservation:

- Fuel certification procedures
- Tanker refueling vs. shore refueling
- Use of gray tactical airplanes as red air

- Lack of standardization with aviation
- Strict training requirements

Finally, participants noted that there aren't any promotion rewards for conserving energy: "Is there a spot in a FITREP for the fact that you conserve fuel while you steamed in your deployment? ... Individuals aren't responsible for their consumption therefore why worry about it?"

Process Barriers

That's procedure; that's what we're supposed to do. I mean, you're required to strip so many tanks every week, and then we don't have anywhere to put it once you strip it."

Participants noted several areas where processes were not aligned with energy conservation goals. First, participants pointed to several Navy processes that negatively impact conservation efforts:

- Poor budget processes
- Poor estimation processes
- Travel to Fallon for training
- Start-up procedures for engines
- Tank cleaning procedures
- Refueling queues

In addition, there were several organizational barriers that surfaced during our interviews. As one program manager noted: "There are challenges bringing the engineering and fleet communities to the same table—priorities, schedules, and preconceptions are different." These differences included both communication and strategy challenges:

- Conflicting priorities
- No dedicated personnel; everyone is juggling other priorities and deadlines
- Insufficient communication between working groups and military branches
- Decisions must be made at a high enough level to authorize operational AND technological changes
- Many processes (Certification of Alternative Fuels / Additives) are not yet defined

Discussion

Discussion and recommendations

As we've shown, established research on conservation demonstrates the impact that individual efforts to conserve can have on lowering energy costs. These efforts often cost little and are able to be implemented quickly. In fact, since 1985, the Navy has reduced energy demand at facilities over 30% by hitting the low hanging fruit.[101] There is no reason to believe that similar efforts with the tactical forces cannot be achieved. The SEMCI and i-ENCON programs have already demonstrated the value of voluntary reductions in energy use. Additionally, recent reductions in fuel usage for maritime forces indicate that when ordered to do so, ships can reduce their fuel use through behavioral changes.

Our research on the key factors leading to successful behavior change in energy conservation indicates that individual attitudes and motivations impact the degree to which people are willing to modify their behaviors in order to conserve energy. We have also shown how cognitive mechanisms and strategic communication efforts can impact behavior. Finally, our interviews with selected tactical personnel uncovered a variety of issues that support or inhibit conservation behavior change, issues that must be addressed when structuring an effective conservation effort within the tactical forces. Based on our findings, we believe that an effective conservation strategy for the Navy's tactical forces should utilize and improve upon existing programs, include a process for evaluating conservation capabilities, support a multi-faceted communication strategy, and include a risk communication plan.

Utilize and improve upon existing programs

Our research on key factors in conservation indicates that there is a range of factors that impact people's willingness to conserve. There is not one way to accomplish conservation, so a multi-faceted approach is called for. The i-ENCON, SEMCI, and Simulator programs each offer complementary but different approaches to conserving energy. The success that these programs have had to date should be capitalized upon, and we recommend two steps in moving these initiatives forward.

First, we believe that the Navy should consider expanding their support for these programs. Starting with the i-ENCON program, we recommend that the Navy consider extending the program across the Navy and DoD, beginning with the naval aviation forces. Another way to further this support is to increase the awareness of the program so that potential participants can be better informed of the benefits. The SEMCI program has also shown value and great potential. With recent efforts to expand smart metering, this program could be expanded to other ports as they implement the smart metering systems. Finally, although the Simulator program does have potential to supplement training time, the program needs to be improved if it is to be expanded. Both maritime and aviation forces indicated that access was an inhibiting factor for them and we recommend that this limitation be addressed. In addition, our interviews indicated that the simulators need to better replicate current aircraft. Simulator programs have been lagging behind plane modifications and updates and are therefore limiting their training effectiveness. One way that this can be improved is through tighter tracking within the acquisition cycle.

The second way that the Navy can capitalize on their successes is through an expanded use of incentives. Our interviews indicate that the cash incentives supplied by i-ENCON are seen as valuable when they visibly impact sailor's everyday lives. For some, these cash incentives are sufficient initial motivators for conserving energy. However, cash incentives alone are not sufficient for sustained behavior change. For this reason we

[101] October 20th, http://dodenergy.blogspot.com.

recommend that existing and new programs include strong social incentives as well. Personal recognition, team and service pride, and social pressures are all effective motivators for conserving energy. The Navy can utilize these kinds of incentives by expanding opportunities for recognition. For instance, the Navy could include conservation as part of existing reward systems such as the Battle E award. Inclusion of conservation incentives in existing reward systems can help the Navy build a culture of conservation.

Third, the Navy should capitalize on the operational strengths of the SEMCI and i-ENCON programs. Both of these programs, with their strong focus on operational behaviors, encourage participants to reduce their energy use through the use of recommended best practices. The i-ENCON program in particular has a comprehensive list of operational behaviors that they use to make people more aware of where and how they use energy. The SEMCI programs also addresses operational behaviors through the use of their REMs. I-ENCON additionally provides a set of tools for monitoring energy use, while the SEMCI program, with their SCADA data, has a sophisticated data collection tool that can provide feedback on operations. Our research tells us that having clear goals, measurable outcomes, and feedback on movement towards those outcomes increases conservation. The SEMCI and i-ENCON programs are both good examples of how we can apply this to Navy operations.

Tailor your themes, messages, and channels to key audiences

Findings from the literature on effective messaging, as well as the findings from our interviews with aviation and maritime forces, indicate that communication efforts in energy conservation can be most effective if there is a range of themes and messages. Specific audiences are motivated differently, which calls for tailored and adaptable communication approaches. To support adaptability, the communication plan should target key change agents, include strategies for raising and maintaining differing levels of awareness, align with shared goals, frame messages in the appropriate way for diverse perspectives, and utilize the most effective communication channels.

Target your communication efforts on key change agents—COs and Pilots

Organizational change is most effective when it is integrated throughout an organization and has strong support from leadership. First, the Navy's strong command/control culture should be leveraged to increase conservation behaviors. Our interviews indicate that in maritime forces, the commanding officers play a pivotal role in energy conservation. A ship's CO has a wide degree of latitude in executing orders and, even when confronted with a mandatory reduction, may choose to execute to that reduction in a variety of ways. Likewise, pilots are given a great degree of latitude in making decisions about fuel conservation behaviors. Both of these key stakeholders' attitudes and incentives for conserving energy may make or break any conservation effort in the tactical forces. The willingness of these key stakeholders to conserve energy is influenced by their own leadership's position on conservation, by the perceived degree of risk associated with specific conservation behaviors, and by the social and material incentives offered to them. Therefore, we recommend that strategic communication efforts follow these guidelines:

- Target COs and Pilots as key influencers in conservation
- Integrate all of Navy leadership in your change efforts—from the SECNAV down
- Design a risk communication strategy to improve decision-making
- Provide social incentives related to promotion
- Provide material incentives that permit the discretionary transfer of funds

Second, ship COs play an important role in influencing the behavior of junior officers and operational staff. In our interviews, we saw that most of the operational participants in maritime relied on the orders of their commanding officer when it came to individual conservation efforts. Their individual willingness to conserve came into play only when the activities did not conflict with the commander's individual style and attitudes.

Discussion

That is not to say that operational staff cannot serve as change agents themselves. Our research indicates that operational staffs are often aware of specific incidents of energy waste and that many of the younger sailors are more responsive to direct conservation appeals. Based on our observations, we recommend the following strategic communication efforts:

- Improve outreach to operational staff
- Provide social incentives related to peer approval and Navy pride
- Provide material incentives that impact operations
- Utilize younger Navy personnel that are more amenable to conservation

Raise and maintain awareness

Our research indicates that when it comes to awareness of the need to conserve, the key factors are varying levels of awareness, varying energy conditions, and the link between message and behavior. First, there is a lot of variability in the level of awareness of the need for energy conservation. In our interviews, we saw that some individuals were made aware of conservation because of mandated fuel cuts, some by their own personal experiences with recent increases in fuel costs, some by their families or upbringing, and some by their own consciousness as "greenies." Still others rarely consider the cost or impact of energy use. Regardless of how people become aware of energy conservation, more direct feedback between action and outcome increases the likelihood that people will conserve. Because of these varying levels of awareness, we recommend that Task Force Energy:

- Increase awareness of the impact on war fighting
- Increase awareness of the impact of lower logistical support costs
- Increase awareness of the environmental impact on seas and waterways
- Increase awareness of the impact on naval families
- Include specific and appropriate feedback on the effect of specific conservation behavior (e.g. usage data, daily reporting, and competitive ship rankings)

Align with audience goals

Some of the participants felt that conservation was well-aligned with their personal goals; however, most expressed some tension between conservation goals and warfighting goals. In our research with the tactical forces, mission completion and mission effectiveness were at the top of the list of desired warfighter outcomes. Importantly, conservation goals were often seen as being in conflict with warfighting and operational goals. For conservation messaging to be successful, it must support the audience's goals. For instance, communication messages that can translate cold iron conservation efforts into more days at sea would likely be more effective than messages about general efficiency. Likewise, in the aviation community, saving aircraft fuel on one type of training mission in order to transfer the savings to increased training in another area would also be more effective than more general messages. There are other incentives as well that might be used to motivate conservation and should be incorporated into any communication plan. We have seen that material incentives are effective, so messages can convey the material impact of energy conservation on individual ships and naval personnel. For instance, making clear that those who conserve more can attain better living conditions, more time off, and increased privileges can be an effective motivator for some. For others, social incentives are more effective. In our interviews for instance, one sailor was shocked to have us ask for his input and thanked us for including him. Another pointed out how well the use of social pressures worked in his ship's drunk driving reduction program. Social acceptance and recognition can be powerful motivators and should be incorporated into any strategic communication plan. We recommend that a strategic communication plan address the following audience goals:

- Align with the goals of mission accomplishment
- Include messages that convey the impact on operations
- Provide material incentives that increase training and exercise time

- Provide social incentives that impact daily living conditions and social standing
- Reach out to operational staff to deepen the cultural change

Frame messages in terms of capabilities and personal integrity

While successful communication (and conservation) plans should align with organizational and personal goals, it is not always clear that there is an alignment. This is one of the key roles of strategic communication—to frame the request in a way that appeals to the audiences existing values. These value frames should reflect the social norms of the Navy. In our research with the tactical forces, we found that support for defense capability and personal integrity were both strong value frames.

First, maintaining a strong defense capability is a predominant theme or frame in the Navy. More resources for operations, shortening the logistics tail, and empowering the war fighter are commonly held values of the Naval forces. Communication messages that emphasize these values will be more likely to have impact. Additionally, of particular note is the common desire to improve battle space efficiency. Efficiency by itself does not seem to have a strong emotional resonance with our participants; however, framing energy conservation as a force multiplier capitalizes on shared warfighter values.

A second value that surfaced in our interviews was that of personal integrity. In many of our participants, personal and professional integrity was an important part of their perceptions of self. These values include family belief systems that stress environmental stewardship, professional values of pride of service and unit, and leadership values that stress personal responsibility for resource use. In addition, a communication plan might also call for other related pride and honor frames such as being innovative, being the best, and working together. All of these values align with conservation goals and should be used to frame requests for action. Calling on Naval pride of country, service, unit, and family may be a useful way to leverage the competitive spirit of the Navy as well. We recommend that messages be framed and tested that support the following value frames:

- Increased defense capability
- Increased "Battle Space" efficiency
- Pride of service/unit
- Competitive challenge
- Conservation as a force multiplier
- Conservation as a family value
- Conservation as personal responsibility

Utilize the most effective communication channels

Strategic communication research tells us that careful consideration should be given to the selection of communication channels or media. The selection of channels should be selected based on the target audience, and messages should be simple and easily understood. Ship's COs, pilots, and maritime operational staff indicate that peer and face-to-face communication are important information channels. Our participants also indicated that print and electronic media were not a source for them of either basic information on conservation or specific feedback on individual energy use. Therefore, we recommend that conservation messaging be increased and tailored to specific audiences:

- Map information channels to audiences
- Select media based on audience needs and norms
- Utilize personal forums (networking, communities of practice, focus groups, suggestion boxes)
- Design and test messages for clarity, vividness, saliency, and personal relevance
- Utilize visuals and examples to clarify what is expected

- Include specific feedback on the impact of energy reduction behaviors in other operational documents (e.g. maintenance manuals)

Develop a risk communication plan

Our interviews with maritime and aviation personnel uncovered a strong risk component as evidenced by repeated references to safety. As one example, Captains of ships made key decisions on whether or not to operate on fewer engines based on their perception of the risk of floundering. As another example, they made decisions about electrical use on shore based on assessments of the impact on personnel safety. In aviation, safe flying and preventing crashes on landing were primary decision-making factors when deciding to dump fuel, and their decision to use afterburners was based on their assumptions of risk on take-off. These types of risk considerations are an important part of the decision-making process in the tactical forces; however, we neither know the extent to which these assessments of risk are accurate nor which have the greatest impact on behavior. Personal evaluations of risk are known to be subject to a number of biases that affect how risk is perceived. These biases include a tendency for people to base their judgments on other seemingly similar instances whether comparable or not, to find evidence to support their position and ignore contradictory evidence, to rely on prior experiences whether appropriate or not, to make inaccurate assessments of their own risk versus others susceptibility to risk, and to have difficulty judging the true probability of the risk. Perceptions of risk are also known to be influenced by a number of situational factors such as perceived level of control, familiarity with the activity, perceived benefits, and level of trust. Finally, we still do not know the impact or perceived magnitude of the risks across all of the tactical forces.

Because risk is such a key factor in decision-making in the tactical forces, and additionally because risk assessments are so strongly impacted by biases and situational factors, we recommend that further research be conducted. This research should address both the perceived risks to the environment from continued high levels of energy use and the perceived risks to operational safety when employing fuel conservation measures. Specifically, we recommend future research that iteratively identifies, mitigates, and tests risk factors and includes the following steps:

- identify a complete list of the potential risks and risk probabilities
- measure risk perceptions
- determine which risk factors have the greatest impact
- determine which biases are most prominent
- develop messages that address risk perceptions and elicit the desired behavior
- evaluate, test, and revise risk mitigation messages for effectiveness

Design a process for evaluating conservation capabilities

Another key finding from our interviews was that there was a great deal of skepticism about claims regarding reduced energy use. Several COs suggested that the i-ENCON fuel avoidance numbers were not truly indicative of conservation behaviors but were instead reflective of the differing mission requirements. Others pointed out how each ship's activities in cold iron were different and impacted their perceived energy savings. The difficulty in showing clear cut causality between behavior and lower energy costs is one that repeatedly arose. One way to address this difficulty is to design a mission-leveling factor to apply to burn rates, cold iron requirements, and other operational issues that may be identified. Additionally, some measures might focus on the conservation behavior factors that lead to reduced consumption rather than on hard fuel cost reductions per se.

Currently, key incentives for energy reduction are based on end-of-quarter fuel avoidance numbers and fuel reduction mandates from Navy command. The fuel avoidance numbers lag behind the actual behaviors that

may lead to reduced energy use. They are a lagging indicator and, as such, are confounded by a multiplicity of factors, including varying mission sets. In addition, mandated fuel targets, while effective as a motivating factor, do not provide any assistance to COs in identifying actions to help them meet the goals set by leadership. Conservation behaviors, on the other hand, provide a leading indication of successful energy reduction; specifically, such a focus can help potential conservers become aware of specific conservation behaviors that may result in reduced energy use. The i-ENCON checklist is an example of setting criteria for leading indicators. They identify a range of behaviors, from sailing and maintenance practices to turning off lights, that lead or are coincident with the conservation efforts. As mentioned earlier however, these criteria are primarily operational and are therefore not comprehensive. They do not include all of the social factors that are key to encouraging individual participation. To help potential conservers see the range of activities that can help them meet fuel usage goals and to provide the Navy with additional indicators of conservation success, we recommend that the Navy, as part of their strategic communication plan, develop an assessment tool that measures conservation capacity. The assessment tool can help Navy leadership measure compliance and develop a culture of conservation. This tool should include a range of activities and factors that are shown to lead to energy reduction, for instance:

- Include attitudinal, motivational, and cognitive factors related to conservation
- Include recommended practices tailored for maritime, aviation, and land forces
- Include recommended activities for outreach and organizational communication
- Include measures that measure the use of existing social structures
- Include measures that are indicative of supportive leadership

Support an integrated communication process

Finally, it is important to design an integrated process that will ensure that your communication efforts are effective and sustainable. This integrated process should ensure that your communication strategy is aligned with your overall strategic direction, has the support of management, has the resources to be successful, and includes on-going assessments.

Each of these components of an integrated plan build on and reinforce the others. When strategic communication efforts are closely integrated with strategy, they serve as a support system for management and are a valued part of strategy formulation. Too often, communication is seen as an implementation tool, not as an important source for including stakeholder input. In short, strategic communication should inform strategy. For instance, a focus on stakeholder goals and attitudes, a key component of strategic communication research, provides empirical data that can be used for informed decision-making. Such data can indicate where organizational goals align or diverge from stakeholder perceptions, identify potential implementation challenges and opportunities, and identify innovative ideas from all levels of the organization.

An integrated process should also include a structured process for designing and measuring the effectiveness of proposed changes. This process should first outline desired outcomes and then define how they can be measured. Next, in the design and testing phase, proposed solutions can be tested with stakeholders. By performing these on-going assessments, the strategic communication team serves a risk-reducing function where proposed policies, processes, and messages are pre-tested with stakeholders prior to an organization wide rollout. They also provide an additional avenue for innovation by providing a forum for stakeholder engagement and input.

Finally, in order for these higher order effects to occur, the strategic communication team should include strong management support that provides the resources and status to impact the organization. First, strategic communication resources should be distributed throughout the organization and include members

with the requisite skills. This team should be responsible for the integration of the voice of the stakeholders in order to increase the ease of socializing policy and process changes. In addition, to fulfill their role as stakeholder representatives, the strategic communication team should have the resources to go deep within the organization to gather input and to embed strategic communication processes throughout the culture. For instance, a communication team might research and design communication channels or design and test specific messages. It might also participate in the design of SCADA reports or performance reports to ensure that they are effective. Second, strong management support means that strategic communication has the status to be effective. High status strategic communication teams should be included at the beginning of any change management effort, be part of the executive steering committee, and be integral to strategy design and implementation. For Task Force Energy to maximize its efforts in energy conservation, we recommend that they ensure that they have a robust strategic communication strategy[102].

[102] For a useful approach to risk assessment and communication, see *Risk Communication: A Mental Models Approach* by M. Granger Morgan, Baruch Fischoff, Ann Bostrom, Cynthia Atman, Cambridge University Press, 2001.

Methods

This study used qualitative, semi-structured interviews to assess the role of communication in energy conservation efforts within the Navy. Qualitative interviews were effective in our research because we were interested exploring in detail the communication efforts that were effective or ineffective in motivating energy conservation behaviors in our participants.[103] This method resulted in findings derived from the participant's perspective rather than those imposed by the researcher, enabled follow-up questions for greater clarification, and allowed for new, unanticipated insights about communication and energy conservation.

Participants

Participants were selected from a balanced cross section of Maritime and Aviation forces. Volunteers were solicited from selected Department of the Navy program managers identified by Task Force Energy and resulted in 18 participants, including one Rear Admiral, one Captain, three Commanders, four Junior Officers (specific ranks?), and one enlisted sailor (specific rank?), and eight civilians. The positions held by participants included three Commanding Officers (two Navy ship COs and one Aviation squadron CO); four staff members (OPNAV, Fleet Forces, Task Force Energy, and Office of the Secretary of Defense); three program managers (i-ENCON, Shore Energy Manager, Shipboard Resource Efficiency Manager) and eight fleet operators (engineers, main propulsion assistants and navigators [shipboard]; pilots (rotary and fixed–wing) and NFO's (fixed-wing) [aviation personnel]. In total, there were seven participants from the Maritime forces, seven participants from the Aviation forces, and one each from Expeditionary, SEMCI, and a Rear Admiral.

Procedure

Interviews were conducted via telephone, recorded, and transcribed for analysis purposes. All participants were anonymous and referred to in the study only by their job title. The transcriptions were initially coded by one of the researchers for primary themes. Following this initial coding, the other three researchers reviewed the transcripts using the preliminary coding structure, isolating quotations for each theme and adding themes where necessary. Following this second coding pass, all four researchers met to compare coding notes and narrow the codes to a final list of themes supported by quotations from the interviews.

[103] Creswell, John W. (1998). Qualitative Inquiry and Research Design: Choosing Among the Five Traditions. CA: Sage Publications.

Appendix

i-ENCON Checklist For Successful Shipboard Energy Conservation

The ENCON check list provides a periodic qualitative self-assessment of ship progress in following good energy conserving practices. It can be utilized by ship's command to identify the areas where a ship needs better energy conservation practices for improved fuel economy.

Strong Command Commitment?

- Is your CO committed to ENCON? Strong Command commitment is necessary for successful shipboard energy conservation.
- Did your CO attend the ENCON Seminar? This aids your ship in attaining the highest marks for the SECNAV Annual Energy award evaluation by NAVSEA ENCON Team.
- Does your CO check the ENCON web site quarterly to check the progress of your ship?
- Did your ship get the honor of being listed in the "Top 25 Ships" during a quarter?

Top Five (5) ENCON Practices

- Drifting Mode or Anchoring Underway (up to 70% less fuel)?
- Trail Shaft (up to 50% less fuel)?
- Clean Hull/Propeller (up to 18% less fuel)?
- Good Navigation (use OTSR & TESS data)?
- Good Machinery Maintenance?

ENCON Management

- Does your ship have an ENCON Manager?
- Do they chair the Energy Board?
- Do they announce the Energy Tips on PODs and 1MC for all hands' energy awareness?
- Do they check the ENCON web site quarterly?
- Do they submit the SECNAV Annual Energy Award package to OPNAV & NAVSEA?
- Does your ship have an ENCON Review Board?
- Do they conduct inter-departmental zone inspections?
- Do they recognize individuals when important energy savings initiatives are achieved?
- Did you receive energy incentives cash awards in augmented OPTAR?
- Announces to all hands on cash awards and encourages sailors to do more on ENCON?

Training & Awareness?

- Did your ship's senior officers attend ENCON Seminar?
- Did engineering personnel attend ENCON Workshop to learn how to use SECAT software? The ship energy Conservation Assist Training (SECAT) software helps to develop fuel consumption curves, optimum transit curves and replenishment requirements?

Fuel Consumption & Optimum Transit Curves?

- Does your ship have fuel oil meters (FOM) installed on all main engines? If not, contact your port engineer to install MACHALT 370a.
- Are FOMs in good operation condition?
- Are FOMs calibrated regularly?

- Does your ship service generators have FOMs? If not, you can use charts in SECAT software to determine fuel usage per kW.
- Are fuel consumption curves maintained to reflect current performance?
- Are fuel consumption curves posted on the bridge, engine room and Main Engine Rooms?
- Are fuel consumption and optimum speed curves used for planning ship's daily operations?

Navigation & Ship Handling?

- Is energy considered when charting navigational routes?
- Does your ship use OSTR & TESS Data?
- Does your ship avoid shallow waters?
- Does your ship attempt to minimize speed change whenever possible while maintaining station (frequency and magnitude)?
- Does the helmsman use minimum rudder angle to keep on track (3 deg or less)
- Does your ship attempt to operate at or near economical speed as much as possible during independent operations or long transits?

Hull Cleaning

- Does your ship have an on-condition hull cleaning program?
- Does your ship use NAVSEA Chapter 081 judiciously?

Propeller Cleaning

- Does your ship have an on-condition propeller cleaning program?
- Does your ship use NAVSEA Chapter 081 judiciously?

Engineering Plant Operation?

- Is energy efficient plant alignment consciously selected for each day's operations? (i.e., anchoring underway, at night, drifting, and trail shaft)
- Is bleed air secured regularly when not needed?
- Is the minimum number of fire pumps used whenever possible?
- Are motor driven pumps vice turbine driven pumps operated when needed?
- Are main circulation pumps secured as soon as main condenser vacuum permits?
- Are main boilers excess air controlled for just haze condition?
- Is idling main feed pump secured for improved fuel economy?
- Is a machinery alignment status board conscientiously maintained?
- Is permission obtained from the EOOW for all equipment status changes?
- Is EOSS validated, properly maintained, and routinely used?
- Does your ship use acceleration/deceleration tables?
- Is there a program to minimize fresh water usage such as in daily announcements?
- Are low flow shower heads installed and in good operating condition?
- Are faucets in heads spring loaded or metering and in good operation condition?
- Does your ship minimize fresh water leaks throughout ship (laundry, showers, galley)?
- Is there a program to promote electric load reduction?
- Does your ship secure electrical/electronic equipment when not required to meet the ship's operational requirements?
- Are the minimum number of ship service generators operated when the total electrical load is below 90 percent rated capacity of the generators in operation?
- Are minimum number of A/C units operated when conditions permit?
- Are lights turned off in unmanned spaces?

Appendix

- Does your ship adjust liquid load for slight trim by bow prior to getting underway and does engineering department assure maintenance of trim by the bow?
- Is fuel and water usage documented for trend analysis?
- Is fuel and water usage published in POD?
- Does your ship utilize shore services: electric power? Water?

Engineering Plant Maintenance?

- Are Gas Turbine Water Wash Based on condition?
- Are intake & exhaust systems for GTEs properly maintained to design conditions?
- Are diesel engine fuel injectors properly maintained?
- Are lubrication of all gears and shafting bearings properly maintained?
- Is the insulation of piping maintained in good condition?
- Does your ship have personnel trained and certified in gauge calibration?
- Are all gauges critical to plant performance properly calibrated?
- Does engineering department have a valve maintenance program?
- Are A/C boundary doors in good condition and identified with posted signs?
- Are light fixture cleaned and well maintained

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